The Builder.

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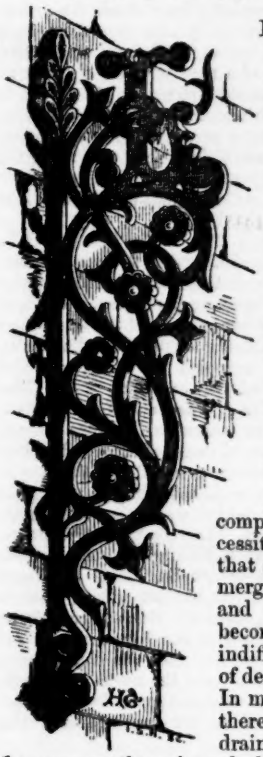
Condition of our large Towns. Leeds.



LEEDS, speaking broadly, is a filthy and ill-contrived town. In some of the streets it is impossible for a person unaccustomed to impure air to remain for even a short time without becoming sick and ill. The stenches are overpowering, and the sights equally so. The paucity of private accommodation is such that in the side streets and open places no delicacy whatever is felt concerning compliance with the necessities of nature; so that even young persons merging into manhood and womanhood have become from habit totally indifferent to the sense of decency in this matter. In many of these streets there is no superficial drainage. If the street be concave, the rain and slops soak down the middle to some lower level; if convex, the liquid refuse runs to the sides of the road, near the pavement, and not unfrequently overflows the latter. Some of the streets in the neighbourhood of Quarry-hill and the York-road are without any road pavement whatever. A week ago the cart-ruts in the roads were 9 inches deep, where the mud was solid enough to allow of an impression in it being left; and in others the cart-road was a narrow channel of liquid mud. Add to this, that with a few exceptions the streets are narrow, tortuous, and badly lighted; and that the air is afflicted with factory smoke; and that side of the picture, it will be seen, is not an attractive one.

Yet Leeds is wealthy and flourishing, and has spent money liberally and nobly. Let us look first, then, on this side of it.

The prosperity of Leeds may be indicated by the following table, showing the amount of money expended on public buildings and public works within the last few years:—

1847.	Borough Gaol, cost	£40,000
1855.	Kirkgate Market	14,000
1858.	Townhall (exclusive of fittings, organ, &c.)	51,625
1859.	New Grammar School	14,000
1860.	New Workhouse	17,000
„	New Overseers' Offices.....	4,500

In addition to these there are numerous works of district property, such as cemeteries and chapels, also places of public worship, statues of Peel, Wellington, E. Baines, M.P., and a portrait statue of her Majesty, all of recent date.

At the present time sums of 8,000*l.* for the Philosophical Hall, and 16,000*l.* for the Schools of Science and Art, and Mechanics' Institutions, are being raised in the town, and the buildings will be proceeded with almost immediately. The extensive Infirmary is about to undergo thorough renovation, and additions are to be made to its accommodation; whilst a new theatre is to be built in a short time. But perhaps what will give the best idea of the resources of this town is the extent of the corporation loans under the Improvement Amendment Act of 1848, which in 1856 amounted to the sum of 512,000*l.*

The public spirit shown in these extensive outlays of money for improvements and additions to its public buildings and works is very great. A large part of this corporation loan is being devoted to the drainage of the town; and it is well that it is so, for few places of equal wealth and importance have been hitherto so miserably drained.

Perhaps it would be impossible to find a town in all England where the house accommodation for the labouring populations has so unequally kept pace with the increase of population as in Leeds. This is not altogether inexplicable when we consider the rate at which the increase of population has proceeded.

We give this table to explain the demand which has existed for the last fifty years for increased houseroom in Leeds and its immediate suburbs:—

Population.

A.D. 1801.	A.D. 1811.	A.D. 1821.	A.D. 1831.	A.D. 1841.	A.D. 1851.
53,302	62,665	83,943	123,548	150,234	172,270

It is believed also that in the census of 1861, the population will have reached 200,000. Thus it will be seen that in fifty years the population has been nearly quadrupled, and between the two last decades of years, above 20,000 inhabitants have been added in each decade.

This enormous increase has occurred chiefly in the labouring classes, mill-hands, mechanics, and artisans. There are a few streets built to accommodate the middle class of householders, which necessarily accompany so vast a labouring population. But the decent and comfortable houses of clerks and professional men, bear a very slight proportion to the miles of squalid tenements in dirty, badly drained streets, erected for the artisans and mill-hands. The courts and alleys, and pestilential dens into which the latter have been gradually driven; the filthy habits, the vicious appearance of the lower classes, all these are a foul blot on the town which calls itself the metropolis of the West Riding. And yet, naturally, the working classes of Yorkshire are, perhaps, the most intelligent in England. They are a well-formed, powerfully-built, and healthy race of men—hard workers and shrewd thinkers. Subject to such demoralizing influences as Mr. Hole has noticed in his account of the social condition of the labouring classes of Leeds,* we hold it to be impossible for working men with large families, to keep themselves in even a tolerable condition of health or morals. The forest of factory chimneys vomiting forth their clouds of sooty smoke, such a plague to housewives as even to compel them to dry their washed linen before the fires of their single dwelling-rooms; the dye-houses and cleansing-rooms of cloth and other mills, poisoning and defiling every stream, and turning the river into a dense and blackened stinking drain; the narrow and over-crowded streets, the closely-packed dwelling-houses, the imperfect drainage; all these are influences which, acting together on the working man's health and happiness, have made a very considerable impression on his physical and social condition and his appearance.

One very serious evil in the construction of modern houses in Leeds is that of building houses back to back. In this case the houses are placed between two streets or approaches, the entrances being on opposite sides of the block,—each tenement going half way through the whole block. This arrangement results in the evil of an impossibility to get a draught of pure air through the house, and the consequence of very imperfect ventilation. The commonest decencies of life are totally disregarded, but we will let Mr. Hole speak for himself on this point:—

"The physical condition of the majority of the working classes of the town would have been good, had it been subjected to proper municipal regulations during the last thirty years. Decent houses and well-drained streets are scarcely less important than good wages, or day and Sunday schools: but notwithstanding an enormous sum expended in making drains, there are many miles of houses, yards, and streets *unconnected with the main drainage*. In Leeds, the reprehensible mode of building cottages back to back, has been almost universally the custom, and in spite of its known evils, it is allowed to go on, no steps being even contemplated to check its growth. The unfortunate dwellers in miserable streets so constructed, sometimes struggle for a while to maintain an aspect of decency about their little dwellings, but at last the accumulating filth renders it impracticable, and they give up the contest in despair. One privy to *four* cottages, has been settled to be the *legitimate* allowance in Leeds; but this liberality of supply has been by no means universally attained. A favourite plan, and almost inevitable on the back-to-back system of building, is to plant the privies for a number of houses in the centre of the row, with a sleeping-chamber over them! Every question of convenience, or even of common decency, seems sacrificed to the one consideration of getting the largest possible return for the money invested."

This is the calm statement of a man, who, perhaps, knows more of the working classes of Leeds, than any other man in the town. We will ask the wealthy manufacturers of Leeds—the men whose riches and luxuries are the product of these dwellers in dens of fever and filth,—whether they approve of such a dreadful state of things? Revelling in the beautiful suburbs of Kirkstall and Headingley, surrounded by every luxury that boundless wealth can procure, it would yet be well if these woollen lords would realize the fact, that upon them devolves a responsibility in this matter. They live upon the industry of their armies of workmen and workwomen. Is there to be no reciprocal feeling between them? We well feed and cleanly house the horse which carries us, and does our work well; are we to leave these other animals, these men who do our bidding and create our riches, in a worse case than the soulless brute? You, millionaires of Leeds, have no slight responsibility. Ask not yourselves, in a tone of contempt, "Are we our brothers' keepers," for society has determined that you are. In so far as you derive your wealth from their labours, so far are you debtors to them, and they are claimants upon you for the righteous treatment which you willingly bestow on your horses,—if for no better.

It is impossible that the working men themselves can remedy the evil condition of their dwelling-places. The artizans may get well paid, but they marry early, and generally have large families. But supposing them to begin life with a virtuous determination to do well, and keep themselves respectable, it is easy to see how the struggle is maintained. Universal filth around them, and stench about and above them; companions who have long since given up the struggle in despair, whose vicious pleasures and demoralizing recreations alone seem to modify their evil plight,—all these gradually coerce their resolutions, and sap away their good intentions. Where it is impossible to give even the opposite sexes the common decencies of privacy in their houses and sleeping apartments, we must expect immoralities, and the result to be regarded as a matter of course, and as nothing wrong. Where dirty streets, and crowded houses make men feel that their self-respect is gone, and that they are part and parcel of the system which includes these evils, we must expect them to fly to public-houses, and escape for awhile the miseries of home; though by this they are only perpetuating the evil, and entailing it with all its dread consequences on their children. Consequently, we find the low public-houses and beershops, and cheap places of amusement in Leeds, crowded in every part. The houses of recreation are brilliantly lighted, and music offers its attractions also to a music-loving population. The working man is well paid, and in these places he gets all the indulgences which money can procure him. In *one* den of so-called amusement, we are told that there is a greater average nightly attendance, than at the evening classes of the seventeen Mechanics' Institutes put together. The low beershops and public-houses are so numerous in the neighbourhoods of the artizans' houses,

* "Light more Light;" an able essay on the present state of education amongst the working classes of Leeds, and the means of improving it; by Mr. James Hole, Hon. Sec. of the Yorkshire Union of Mechanics' Institutions, recently published by Longman & Co. To this work a premium offered by the Dean of Chichester, before he left Leeds, for the best essay connected with the social advancement of the working classes, was awarded.

that every twentieth house seems to be one of them.

We do not wonder that Leeds has to build enormous gaols, and workhouses, and reformatories. We cannot be surprised that Leeds should exhibit her criminal list, and demand that the assizes for the West Riding should be held in her Town Hall. But we will suggest to this metropolis of the West Riding, that her great men most imperfectly understand the very elements of political economy. They build a grand townhall in which assize courts can be held; they build an enormous gaol in which to incarcerate the convicted criminal; they add workhouse to workhouse where the spirit-broken pauper may decline and die at the public expense; they build a reformatory where young thieves who have graduated in the profession are prevented the practice of it,—and we are willing to allow these are, one and all, very excellent *correctives*,—but where are the *preventives?* The seed-beds of the crimes are allowed to exist and flourish in all their rank luxuriance. We do not hesitate in affirming that if proper control were held over the building of houses for the working classes; that if the streets were kept clean, and the river, streams, and canals were restored to their original purity; that if the drainage were properly carried out, and the dens of infamy and demoralization kept sternly in check, there would be a vast change and improvement in the condition of the town. It is never too late to begin. The town has already been saddled with the expense of correctives, let it now devote some attention to preventive measures. The municipal authorities may do a vast deal of good by exercising an undeviating control over the building of dwelling-houses for the poor. They will find that cheerful, roomy cottages, well ventilated and thoroughly drained, with proper accommodation for division of the sexes, and private offices for each house; all these are powerful antagonising influences against the crime and pauperism which now cost them such enormous annual outlays. If for each reformatory a dozen schools were built,—for each gaol a town were drained,—for each workhouse a Building Act enforced healthy cottages,—we should show our knowledge of political economy, and social science would triumph over police statistics.

Light, air, clean water, and elevating elegance in our streets, are in the end cheaper than gaols, reformatories, and workhouses. You must let men have the former with the addition also of room, or they will qualify themselves for the latter; and in any case the public has to pay, either for the preventives or the correctives, the happiness or the misery.

It was a natural remark which we heard a visitor make, whilst gasping the vitiated atmosphere of Leeds, "Surely these people have not enough air to live upon." One is almost willing to believe this, literally. It is a wonderful sight to see the chief approach to Woodhouse-moor on a Sunday afternoon and evening in summer. Woodhouse-lane becomes one huge footpath; pavement and horse-road are crowded with eager pedestrians, hastening upwards to the moor to get a breathing of un-heated, unsmoked pure air. In Holbeck also, where dwell many thousands of operatives, there is a general exodus to Holbeck-moor. Every outlet into the country is crowded with persons to whom the luxury of pure air is denied during the week. If you ascend any of the ridges or eminences which surround Leeds, and thence, on a Sunday morning or afternoon, regard the prospect, you will see the whole landscape dotted over with groups of figures; and would find it difficult to cast the eye on a country footpath or green field for miles around, where families and friends are not luxuriating in the blessings of a clear atmosphere. We see something like this exodus to the country in the suburbs of London on a Sunday. Leeds is a terribly rainy place, the atmosphere is dense and heavy, and retains perennially the smoke and sulphureous stenches of factory chimneys, iron foundries, dye shops, and cleaning houses, with which the town is crowded. The streets are narrow and not well lighted, except in instances which could be counted on the fingers. Even in London we know nothing like the narrowness of the ways, whilst the traffic in many of them is only surpassed in important streets in the metropolis, Liverpool, or Manchester.

We have surely said enough to show that great changes are needed in Leeds, and we earnestly call on the right-thinking, intelligent, shrewd, and wealthy inhabitants of the place to set about the work.

Millionaires of Leeds! you *are* your brothers' keepers.

ON CHURCH AND CONVENTUAL ARRANGEMENT.*

Cistercian.†—The characteristics of the churches of the Cistercians, like the Clugniacs, a reformed congregation of the Benedictine order, is an extreme simplicity in outline—absence of triforium and pinnacles, a single central tower, a simple west front, and plain undivided windows—for no ornament of any sort, not even of painted glass, was admitted—and a flight of stairs led from the transept into the dormitory. Clairvaux had a chevet, with nine radiating square-ended chapels; two east chapels in each wing of the transept, and two in each of the western aisles of the transept. There was a large west porch; stalls for the clergy were set on the west of the transept, and for the servants at the lower end of the nave. Pontigny, c. 1150-70, where Lanfranc, Anselm, and à Becket, took refuge, had a chevet with seven square-ended chapels, and side chapels to the choir aisles, and west and east aisles to the transept; and Altenburg (c. 1255) has a chevet with seven polygonal chapels; the only English instance of such a termination is said to be indicated at Beaulieu, which, probably, resembled Clairvaux. Alcobaça, in Portugal—1148-1222—has a three-aisled nave, and a chevet with nine chapels. Notre Dame Ruremonde, begun 1218, is of the Rhenish type, having pentagonal apses to the choir and apses, a cupola, with two flanking central towers; and a large west transept and narthex (Schayes, iii. 50). In the twelfth century the order distinguished themselves from the Benedictines by the choice of a secluded spot and the simplicity of their ground plan, which, in its earliest type, was marked by a short square-ended choir, as at Holy Cross, Hore, Boyle, &c., except at Rievalle and Fountains; often aisleless, as at Pluscardine, St. Mary Sweet Heart, Kirkstall, Roche, Furness, &c.; and by having chapels (usually four) on a line with the choir, and opening like an eastern aisle into the transept, as at Sylvacane, c. 1147 (Lenoir, ii. 47). Fontenay (c. 1119), Sernay (c. 1128), Clairvaux, and Novitac, built by St. Bernard, and St. Vincent at Rome. Citeaux was square-ended, but had apses to the transeptal chapels. Vaux de Sernay (c. 1128) was square-ended, with four apsidal transept chapels. Fontenay had a square apse, with square-ended transeptal chapels. This arrangement, which was adopted in the fifteenth and sixteenth centuries at Florence and Rome, appears in England at Kirkstall, Roche, Furness, Netley, Buildwas, Tintern, and Fountains, &c.; and in Ireland, at Dunbrody and Boyle. No Lady-chapel protrudes at the east end. The eastern aisle of the transept was always parted off into chapels (Arch. Jour., xi. 136). The exceptional instance of towers (both Perpendicular) occur at the west end of Furness, and on the north-west angle of the transept at Fountains. At Clairvaux (Viollet le Duc, i. 267), and ordinarily in Cistercian houses where the choir was aisleless, the whole space under the lantern was left open, so as to leave free access to all the eastern altars. The number of four transeptal chapels was sometimes increased to six, as at Rievalle, Fountains (Proc. Ass. Soc., i. 263; iii. 54), Furness, Kirkstall, Dunbrody, and Graig-na-managh. Jorevalle in 1154, presents an advance in the arrangement, having choir aisles; and Byland, which has western aisles to the transept. In France there was a large west porch.

Friars.‡—The churches of the Friars—Franciscan (*e.g.* Kilconnel), Dominican (*e.g.* St. Andrew's, Norwich), and Carmelite, *e.g.* Hulne, were oblong and of unbroken length, destitute of a triforium, and generally provided with only a single aisle or a single transept. The choirs are aisleless, generally flat-ended; but a Franciscan ruin at Winchelsea has an apse. The Franciscan church at Stirling has an octagonal apse. In the fourteenth and fifteenth centuries, tall, narrow towers, as at Roswick, Moyne, Multifernan, Adare, and Kilconnel, were inserted between the nave and choir. Ardfert has a west tower; the cloister is on the north at Moyne, Muckross, and Adare, on the south at Kilconnel. Kilconnel and Muckross have a south transept; Castle Dermot has a north aisle and transept. Reading has a nave and aisles.

St. Andrew's, Norwich (Jour. Arch. Ass., xiv. 80; Harrod's "Gleanings") and the Dominican Friary (Schayes, iii. 153-4), at Louvaine, c. 1230, and at Gloucester, had a nave with aisles; that at Ghent is a square-ended oblong, c. 1240; so is Roscommon, but with a north nave aisle. Conventual buildings were arranged by the Dominicans, as at Sligo and Kilmallock, on the north, and their preaching-yard laid out on the west or south side. Hulne, a Carmelite church, is a mere oblong (Arch. Jour., iii. 141).

The Friars (Lenoir, ii. 205; Viollet le Duc, i. 297; Ecclesiologist, No. cxxxiii.), owing to their destination as preachers, required to place their houses in the midst of a surrounding population; and had to adapt them to the irregularity of the site, large spaces of ground not being attainable. The stalls of the brotherhood occupied the nave, and the congregation occupied the parallel aisle. The cloister of the Jacobins of Paris and Agen were on the north side. The churches in those towns, as at Toulouse, were oblongs of two aisles, but the latter, of the latter part of the thirteenth century, has a chevet with five chapels. Chapels were nor ordinarily added until the fourteenth and fifteenth centuries. The refectory at Toulouse and Paris stood out at right angles to the church. The Austin Friars' house at St. Marie des Vaux Verts, near Brussels, exhibits an oblong church without towers. On the north side of the cloister was the library, on the west the dormitory, on the south the refectory, on the east the day dormitory for the "meridian." On the north and south of the eastern cloister were the guest houses. The infirmary was detached on the south-west of the great cloister.

*Præmonstratensians.**—Two of the most deformed ground-plans, in England, belong to the Præmonstratensian Regular Canons, a reformed branch of the same order as the Austin Canons. Eastby (Proc. Ass. Soc., ii. 317), with its long, aisleless choir, and nave wanting a south aisle, and Bayham, with an aisleless nave and lateral galleries to the transept. The choir is aisleless, but ends in a polygonal apse.

Clugniacs.† — The original Abbey of Clugny bears a marked resemblance to Lincoln Cathedral, built by John de Noiers for Hugh of Burgundy. A peculiarity of Clugniac churches in England is the position of the sacristy, which at Thetford and Castle Acre is attached to the north wall of the transept. In France a narthex, or outer church for penitents, was a distinctive feature (Viollet le Duc, i. 185, 207, 259), as at Clugny, c. 1220; Vezelay, c. 1160; and Charité-sur-Loire, of the twelfth century, with two towers above the porch, four towers flanked the transept, and a central tower formed the lantern. The Abbey of Clugny was composed of a church with a nave with double aisles; a main and choir transepts, each with four apsidal chapels; an ante-church, a chevet with five chapels, and a cloister on the south. Above the great porch in Clugniac churches in France, a chapel of St. Michael was built. At Daventry and Tykford, the outer or farm-court was of considerable size (Monasticon, v. 206, 184).

West Front.—The ordinary west front in a fine building presented a gable between two towers. In the church of a nunnery, as at Romsey, there was no west door. The west fronts presented high-pitched roofs and gables, when stone walls replaced the old flat wooden roofs, and were especially useful in the snowy and rainy North. The mystic triangle of the Trinity in the pediment was replaced by the gable cross; and triumphant angels, apostles, evangelists, saints, and stories from Holy Writ and legends, arranged over the front, formed a guide of Christian life and vast systems of instruction. Occasionally, on a German type, in the central compartment there was a western tower, as at Belvoir, Ely, Hereford; imitated afterwards at Bolton, Wimborne, Christchurch, Hants, Shrewsbury, and Waltham. The same plan is observed at Mechlin, Limerick, Dantzic, Roeskilde, St. Vincent's, Soignies; St. Gertrude's, Nivelles; at Fribourg, St. Germain des Prés; St. Savin's, and St. Benoit-sur-Loire; but they were soon placed at the angles to show the

* By the Rev. Mackenzie E. C. Walcott, M.A. See p. 793, *ante*.

† Jour. Arch. Ass., vi. 309, 312; Ecclesiologist, cxxxiii.: Viollet le Duc, 207, 250, 264, 269; Fosbrooke, Brit. Mon., 112.

‡ Fosbrooke, Brit. Mon., 117, 121.

* Lenoir, ii. 478; Fosbrooke, Brit. Mon. 115.

† Fosbrooke, Brit. Mon., p. iii.; Viollet le Duc, i. 257, 250.

arcading and windows of the front. We also find a western church attached, as at Sherborne, Glastonbury, and Tynemouth (Mon., iii. 311; Collinson's Somerset, ii. 263; Harston's Sherborne); and similar instances in the Clugniac churches, and St. Front's, Perigueux.

*Porches.**—A Galilee (Ducange, s. v.; Lenoir ii. 80) occurs at Durham, Ely, and Snettisham: it may have derived its name from being the most distant portion of the church from the altar, or from the circumstance of its being used like a lych-porch for the dead, with a touching allusion to the fact that our Saviour, after His resurrection, showed himself so frequently to His disciples in Galilee. The third week after Easter by the Greeks, and Wednesday in Easter week by the Latins, was called Galilee from this circumstance. This porch was used as their last station by processions. It is found on the south side of the transept at Lincoln. The porch was probably a vestige of the narthex of the primitive church. In it the children of the abbey serfs were baptised, and the office was said, at which the domestics assisted. It was also used on Palm Sunday to arrange the procession, and to receive great personages in bad weather. At Clugny it was as large as a church. It was often a sanctuary, containing a ring which the fugitive clung to, as at Durham (Fosbrooke, Brit. Mon., ch. xlix.) and at Cologne, where there was an inscription, "Hic stetit magnus reus." It was also used as a parlour for conversation with persons who were permitted to enter the actual monastery. On the stones the measurements of weight and length were sometimes carved, as on a nave pier at Old St. Paul's. In the twelfth century porches were often superseded by grand portals. There are large porches at the west end of Peterborough and Chichester, south transept of York, and the north transept of Westminster. Large northern porches were added on the town side at Salisbury, Wells, Hereford, Christchurch, Worcester, Wells, Durham, &c.

Gallery.—The gallery in front of churches took its origin from the necessity of accommodating the choir, who sang "Laus, Gloria," &c., when the procession on Palm Sunday returned from carrying the sacrament to the cemetery. Frequently windows were grouped closely for this purpose, and this may have been the design of the huge west arch at Tewkesbury. In bad weather the ceremonial was held before the altar of the Cross, under the choir-screen, and this custom may have led to the construction of minstrel galleries at Winchester, Exeter, and Malmesbury. Galleries are found at the west end of the nave at Le Mans and Jumiéges in the north transept, and in the north nave aisle at Winchester, in both transepts at Bocherville, in the south transept at Westminster, Hexham, and Cerisy, and like a small arcade at Elgin.

Doors.—The north nave door was allotted to the laity, that on the south opened into the cloister, the exceptions are where the conventual buildings were on the north side of the church. Romsey, being the minster of a nunnery, has no west door.

Towers.—Towers had frequently an altar of St. Gabriel or St. Michael, the conductor of souls (perhaps in allusion to the Paradise below, or the legend of his apparition, c. 490 and 706), (Johnson's Notes, Ethelred's Eccl. Laws, 1014, c. 2), and the interior was frequently covered with sepulchral inscriptions. A chapel of St. Michael, in Clugniac houses, was built above the great door. The great tower of St. Benoit-sur-Loire, c. 1026, was called St. Michael's; the central tower of Canterbury is called the Angel tower; and on the highest gables of Wykeham's colleges are statues of St. Gabriel or St. Michael. Three towers were built at Canterbury, York, Wells, Lincoln, Durham, Llanthony, Southwell, and Ripon, as at Westminster, built by Edward the Confessor (Publ. Rec. Comm. 1858, p. 244); Lichfield alone retains its three spires. Ely and Peterborough have central lanterns; Salisbury, Norwich, Chichester, and Oxford have central spires. Two western towers were designed at Norwich and Chichester. At Chichester, as once at St. Paul's, Salisbury, and Westminster, Worcester (Arch. Inst. Worc., 103; and Crowland, Proc. Ass. Soc., iii. 273), there is a detached belfry-tower. At Rochester it is attached to the north transept; at Dunblane to the south transept. At Wymondham (Monast., iii. 328; Arch. Inst. Norf. vol. 1851, p. 115), the abbey steeple, built over the three eastern nave-bays, shuts off all communication with the nave, which served as a parish church. Aberdeen and St. Andrew's have two west towers. Elgin had three towers, with large turrets flanking the east end. Fortrose has a single west tower. At Exeter the towers form transepts—a very convenient arrangement for the monks (Viollet le Duc, i. 168), when tolling the bells for the night offices, or when a large congregation filled the nave. The same arrangement prevailed at St. Germain des Prés, Clugny, Vezelay, and Chalons-sur-Marne. The western towers contained the bells rung on feast days, and as a summons of the laity to service. There are towers to the choir transepts at Canterbury, and tower-turrets at the west end of Salisbury, and Peterborough, and Rochester, to the east end of Chichester, and Exeter, and Norwich, to the transepts of Peterborough and Ely, and at the west and end of Winchester. Turrets flank the choir of Peterborough.

Transept.—There are aisleless transepts at Canterbury, Norwich, Carlisle, Worcester, Gloucester, Exeter, Rochester, Kilkenny, Romsey, and Bristol; but the place of an aisle was ordinarily supplied by the erection of eastern apsidal chapels or square, as at Exeter. St. Patrick's has a quasi-aisle. St. Stephen's, Caen, as Canterbury had, has an internally formed lateral aisle. Scotland, like France, ordinarily presents only a quasi-transept. Transepts with east aisles for chapels are found at Peterborough, Hereford, Lichfield, Selby, Whitby, Ripon, Lincoln, Roche, Jorevalle, and Howden. Double aisles flank the transepts of Winchester, Ely, York, Wells, and Byland. One of the compartments at Winchester retains its name of the calefactory, the place for lighting the censers. A stone confessional chair remains in the south transept of Gloucester, and confessionals are to be seen at Maig-Adaire (Fosbrooke, Ency., i. 122). The revestry, as at Westminster, Gloucester, and Christchurch, was attached to the transept; it contained a press for vestments (one remains at Winchester), an altar, and a bell to announce the coming of the celebrant. Transept towers occur at Exeter and St. Mary Ottery, and in Cormac's chapel, on the rock of Armagh, consecrated 1134, as at St. Stephen's, Vienna, Narbonne, and Chalons-sur-Marne. At Angoulême there are towers at the ends of the transept. At St. Lambert's, Liege, there was a south transept tower (Schayes, iii. 136). Choir transepts are added at Salisbury, Lincoln, &c., as at Clugny and Nivelles. In the sixth century St. Germain built chapels in the transepts of St. Vincent's. The chapels were usually founded as sepulchral chantries, and supported by families of distinction, or by bequest of ecclesiastics. There are superb western transepts at Ely, Lincoln, and Peterborough.

The word choir* is first used by writers of the western church, and Isidore, of Seville, derives it from the (corona) circle of clergy and singers who surrounded the altar (Orig., lib. i. c. 3); it occurs in the c. 18 of the 4th Council of Toledo. The position of the ritual choir in the nave may be ascertained by a difference in the shape or ornamentation of the pillars, the presence of a piscina, or marks of the rood-beam. Priests' rooms are found over the vaulting of the nave and choir at Mellifont, Holy Cross, and Kilkenny. In abbeys the choir (Viollet le Duc, iii. 227), raised by steps above the level of the rest of the building, usually extended into the nave, from which it was divided by a rood-screen; and on this side of the transept was the altar for matins and lauds, the nave being left for the guests, pilgrims, &c. Romsey has a raised platform in the nave aisles for the stalls of the nuns. In the cathedral the choir usually commenced on the other side of the transept, which was given up to the congregation; the large aisles were for their accommodation on the same level with the choir, and no stalls obstructed their view. Between the high altar and the bishop's throne, which was placed in the apse, stood a low or matin altar, with the vestment of the celebrant on a stand, and a brazier for kindling the incense. On each side of the entrance of the sanctuary stood a seven-branched candlestick. —(Comp. Fosbrooke, Encycl., i. 124.)

The apse or chevet took its origin in the junction of the common circular tomb-house of the east end, found behind the altar with the basilica, by the removal of the intermediate walls. The tomb-house is still existing, under the name of Becket's Crown, at Canterbury, an imitation of the east chapel of Sens, and like Henry VIII.'s chapel at Westminster; Trondhjem, Batalha, Burgos, and Murcia. Romsey has apsidal terminations to the choir aisles: the central compartment once formed probably an apse (Proc. Arch. Inst., Winchester volume). The choir is disproportionally short at Westminster, Brecon, Brinkburne, and in several Cistercian abbeys. Stalls were introduced at the close of the thirteenth century (Schayes, iii. 125), when the choirs were lengthened and arranged in two tiers. The earliest instances of wooden seats occur in a constitution of Grostête. Three-legged stools were an earlier substitute; there is a mention of their use in the fifteenth century, and of choir-stalls in the Black Book of Swaffham. Lenoir mentions that Romanesque stone stalls remain at Ratzburg (ii. 135). The choir in cathedrals, following the monastic usage, was previously walled off from the aisles by a low partition (Schayes, Hist. de l'Arch., iii. 126), as at Canterbury, Alby, Chartres, Bourges, St. Denis, Amiens, and Notre Dame: in the two latter instances carved with figures. A solid wall still incloses Rochester. The bishop's throne was, when stalls were introduced, removed to a seat in the choir. Sick and strange monks sat in the retro-choir.

Lady-chapel.—The earliest Lady-chapel was built at the west end of Canterbury, and re-erected in the north nave aisle by Lanfranc, but did not assume a prominent position till the thirteenth century (in Belgium, in the fourteenth century—Schayes, iii. 105), and then was usually placed eastward of the choir. It occupied the south choir aisle at Elgin, and the north at Thetford, Hulne, Belvoir, Bristol, Oxford, Llanthony, Wymondham (Monasticon, iii. 328), and Canterbury; but was detached at Ely and St. Martin des Champs; is on the north side of the nave at Waltham and Rochester; on the south of the choir at Ripon (over the chapter-house) and Kilkenny; in the south transept at Wimborne; at Lincoln and Gloucester it is cruciform; at Lichfield and Wells it has a polygonal apse; is in the galilee at Durham, and in the south transept of Wimborne. At Christchurch there is a chantry over the Lady-chapel.

An inclosed baptistery, like that at Luton, is found at Cividade de Friouli, of the eighth or ninth century. At Canterbury it forms a round building near the choir.

At Fountains the marshalling of processions was marked out by stones along the nave, and a line of demarcation to women drawn across it at Durham, as at Canterbury and York formerly (Fosbrooke, Encycl., i. 125). A curious acoustic arrangement of pottery was found under the rood-screen at Fountains. The pulpit (Ducange, vi. 263; Lenoir, i. 98, 217; ii. 76; Viollet le Duc, ii. 406) was on the south side of the nave. In Italy stone pulpits are found of the thirteenth and fourteenth centuries, as at Sienna and St. Miniato, Florence. In the twelfth century, as at St. Augustine's, Canterbury, and Bury St. Edmund's, pulpits were used in French churches, but probably were only movable wooden lecterns. In the thirteenth century they became usual, owing to the establishment of the preaching friars, and their employment in the refectory; the earliest is that of Beaulieu. In the fourteenth and fifteenth centuries we find an open-air pulpit in the cloisters or court; as at St. Die, at the Friary, Hereford, and Magdalen College, Oxford; Bishop Latimer preached in Privy-gardens, and his contemporaries at Paul's Cross. In churches they appear first in the Perpendicular period. There is a stone pulpit at Wells. The bishop's throne (Lenoir, i. 205; ii. 115, 239; Viollet le Duc, ii. 22, 279, 414; Ducange, s. v., Cathedra) was formerly of stone, as at Canterbury, Norwich, Avignon, St. Vigor, and Rheims. At the close of the fifteenth century they began to be of wood. Sedilia, rare in France, are found in Normandy and Brittany, and appear in England at the close of the twelfth century. There are generally three seats connected with a piscina in England, but four occur at Furness and Paisley, and five at Southwell. In place of the triumphal arch of the basilica, a trabes (Lenoir, i. 185) was set up, richly carved and adorned with tapers. An altar of the crucified, used in the ceremonials of Palm Sunday, was erected in the nave of St. Gall, round which the sick monks on All Saints' Day took their place. The most ancient in Belgium is that of Louvaine (Schayes, iii. 127), of the sixteenth century. The finest in France is in the Madelaine, Troyes.

At St. Ambrose's, at Milan, and St. Miniato's, at Florence, altars, as was usual in Roman churches, were placed in front of the choir. A screen was added in the thirteenth century, and this addition was multiplied in the two following centuries (Schayes, iii. 126). It was used for reading the Epistles, Gospel, certain lessons, letters of communion, edicts of bishops, and acts of councils, and in some places for the benediction of the bishop, whence its name of jube. At Clugny the laity were communicated at the rood-loft through a grill. They took the place of the ambo and lectern of the basilica, and were used for the reading

* Lenoir, ii. 73.

* Wal. Strabo, i. c. 139; Durand, i. 1—18; Lenoir, i. 183; ii. 249; Honorius, i. 140; Ducange, ii. 336.

of the Gospel and Epistle, and at a later date for the organ and singers. They were composed generally of a central door, closed by a curtain during the celebration, as the ciborium had been veiled, and in the lateral arches were placed altars.

*Screens.**—The rood-screen took its origin in the necessity of protecting the monks from draughts of cold air. As a compensation to the laity for their exclusion, two kinds of screens were introduced, identical in principle, though varying in position and arrangement. One was the choir-screen, in which, as at Chichester, Exeter, and St. David's, an altar was placed on either side of the great entrance from the nave. The second was the nave-screen, in which there was a central altar, forming the matin altar and high altar of the laity, set between the two rood-doors, as that of St. Cuthbert's at St. Alban's. At Guilden Morden (Lysons' Brit., ii. 59) there is a double rood-screen. At St. Alban's they formed a loft used as a dormitory by twelve monks. The rood stood over the choir-screen at Canterbury, but at St. Alban's over the presbytery-screen, a piece of furniture the original of altar-rails, which is still found at St. David's (Jones and Freeman's St. David's, p. 89). At Christchurch, Hants, the screen stood in the first compartment of the nave westward of the lantern, as at Tintern, Fountains, and Winchester. The screen is placed in the second bay westward of the lantern at Buildwas and Norwich; at Westminster and St. Alban's, in the third bay; in the sixth bay at Tynemouth; and in the fourth bay at Jorevalle. Various par-closes screened off chapels in the nave, transepts, and aisles; often, as at Fountains and St. Alban's, blocking up the nave. Against these enclosures and between arches, the tombs of bishops and abbots were placed, but at length were developed into distinct chantries; the earliest instance being that of Edyngdon, at Winchester.

The reredos behind the altar is found at St. Mary's Overye, Winchester, Westminster, St. Alban's, and Christchurch. Immediately behind it, in a retro-choir, was the shrine of the Patron Saint, as that of Hugh at Clugny; St. Louis at St. Denis; at Winchester, St. Alban's, Bury, Durham, Bridlington, Lincoln, Lichfield, Westminster and Canterbury, where the east processional path is on a level with the chapel, but with the floor of the nave at Durham and Westminster. The shrines of saints were in subordinate positions at Rochester, choir transept; Chichester, south transept; St. David's, north side of choir; and Oxford, in a north chapel.

Watching lofts to observe the shrine, remain at Oxford, St. Alban's, Westminster, Worcester, and Canterbury. Chambers for the watchers of the church may be seen at Lincoln (Fosbrooke, Brit. Mon., p. 283), and over the north porch of Exeter. Minstrels' galleries are found at Exeter, Malmesbury, Winchester, St. Mary Ottery, Gloucester, and, perhaps, Westminster. The cell of a recluse remains at Norwich (Proc. Ass. Soc., ii. 349).

Wall Passages.—The triforium (Ducange, vi. 669), which at a later period was treated merely as a portion of the clerestory window, was at first designed to combine (Lenoir, ii. 103), additional height with constructional security, and was used for purposes of accommodation, for a passage, and for hanging tapestries on festivals; it is locally called the nunneries at Christchurch, Durham, and Westminster, where the great size of this gallery was a continuation of the plan of this story in the Confessor's church (Vita S. Edw., Publ. Rec. Comm. 1858, p. 417), which contained altars, and was retained, probably, for the accommodation of spectators on grand ceremonials. It is a feature never found in a Cistercian church. The peculiar wall passages in the lower story in the same church were used by the abbot for the purpose of supervising the monks. The prior's gallery still remains at St. Bartholomew's, Smithfield, and was probably of a similar destination. The wall passages of the clerestory were probably used by the sacristan when he went round to secure the shutters of the windows, then unglazed or merely latticed, in case of rain or storms. The windows were formed of stone, pierced with circles or tracery, like trellis-work in the early churches of the West and East. Glass windows are mentioned at an early date.† Gregory, of Tours, speaks of wooden sashes glazed in France (Glor. Mart., i.; c. lix.), and in 1052, stained glass is described at St. Benigne de Dijon.

A labyrinth (Lenoir, i. 184; Arch., Jour. xv. 218), to thread which was a compensation for a pilgrimage to Jerusalem, is found at Canterbury, and St. Bertin's, St. Omer's; St. Michele, Pavia; St. Quentin's; Aix; Chartres; St. Maria in Aquino; Lucca, and St. Maria in Trasteverino, was introduced in Belgium in the thirteenth century (Shayes, iii. 119). The fridstool, or chair of sanctuary,* remains at Beverley and Hexham. The tabernacle is often an aumbry near the high altar, on the north side. A credence-table remains at St. Cross. After the thirteenth century credences (Viollet le Duc, iv. 372), were introduced in Belgium (Schayes, iii. 123), generally on the right and often on the left of the altar: the latter, divided by a slab, held a basin and cruets, and was furnished with a water-drain below; that on the right was an aumbry, and held the books and ornaments of the altar. An additional aumbry served to keep the holy oil. The piscina was ordained by Pope Leo IV. for cleansing the chalice. It became an important piece of furniture in the thirteenth century, and was provided with a stone bracket for the sacred vessels, and two drains, one for common water, the other for the rinsings of the chalice. Aumbries for the books and processional crosses also remain. An ancient clock brought from Glastonbury, is found at Wells. The "horloge à roues" is attributed to Gerbert, Archbishop of Rheims, or to Pope Sylvester II., c. 1003. The Cistercian rule xxi. prescribed their use, though sun-dials continued in use. The altars had no retables or crucifix, until the end of the thirteenth century (Schayes, iii. 121; Walafrid Strabo, i. c. 139.)

The *sacristy* (Ducange, v. 759; vi. 148; Lenoir, ii. 287, 367) ordinarily intervened between the chapter-house and the church; but is found on the north side of the choir at Thornton; south side of the choir at St. Mary's, York; Lichfield, Leiston, Hulne, Selby, and Furness; and at the east end of the choir at St. Mary's, Warwick, and Malvern; in conjunction with an almonry on the north side of the north transept at Castle Acre and Thetford; and on the south of the south transept at Westminster. It is very possible that the name of the so-called castellan's rooms at Christchurch was a corruption of sacristan's rooms, they being situated on the north-east angle of the nave. The sacristy at Noyon was a two-storied circular building, opening on the east side of the transept.

Conventual Arrangement.†—There was a generally understood rule and an evident similarity in the ordinary mode of conventual arrangement. Where exceptions occur they may be readily traced to some easily assignable cause: (1) the retention of earlier buildings; (2) the habits and requirements of a particular order of monks, or their transfer as architects, or bishops over another order; (3) the nature of the site, existing streets, or old town buildings; (4) defence in exposed situations; (5) modifications of the primitive rule and rearrangement of the buildings at a subsequent period, from emulation with others, from the love of reconstruction, for convenience, grandeur, or imitation of adjoining churches; (6) the perpetuation of the plan of the mother church and convent, by imitation in its cells; (7) the confusion in arrangement, owing to the necessity of providing accommodation for kings, nobles, and guests of distinction, for synods, and sometimes parliaments.

In the case of the lonely Carthusian houses (Viollet le Duc, i. 307; De Caumont, Abec., 178; Monasticon, vi. p. 9),—for instance, Mount Grace,—the oratory and cloister were tomb-like. The brethren lived apart in little cells, each provided with three little rooms and a garden; and only left them thrice daily for church, or refectory on certain days; while they assembled in the cloister-court on eves to read over the lessons appointed for the matins of festivals. At Clermont there was an outer court with cattle stalls and a watch-tower on the west, the guest-house on the south, barns on the north, and the prior's lodge on the east, and the apsidal oblong church, flanked with chapels; to the south of the church was the cloister, with the refectory on the south and the chapter-house on the east. To the east of the church was a large garth, surrounded by separate cells.

Each monastery included (1) a cloister-court; (2) an inner court, with the infirmary, guest-house, kitchen, servants' hall, library, &c.; (3) great or common court, with a double gateway, the larger arch being designed for carts, granaries, stables, store-rooms, grange-barn, servants' rooms, tribunal, prison, and the abbot's lodge: a remarkable instance occurs in the Præmonstratensian Abbey of Ardaines, near Caen; (4) the court of the church, or close, open to the public; and (5) mills, gardens, orchards, &c. There was a court called Romeland — probably from rome, roomy, as in Romney, Romsey, &c.—in front of St. Alban's; the Forbury (Monasticon, iv. 39) at Reading; and at Norwich Tombland, at least since 1302 (Blanfield's Norfolk, iii. 67). By the Benedictine rule (Fosbrooke, Brit. Mon., 112; Fleury, xxiii. 14, 19; v. 207, 213; Monasticon, i. pr.), where six hours were assigned daily to manual labour, every trade and occupation necessary to the convenience of the community were domesticated within the walls.

In the plan of St. Gall, of the ninth century, the library abuts on the north wall, the sacristy on the south wall of the choir. The abbot's house, outer school, and guest-house lie parallel to the north transept and north nave-aisle. To the east of the church are the garden, cemetery, infirmary, and novices' house; to the south is the cloister, with the dormitory on the east, the refectory on the south, and the cellarage with a larder above it on the west. The poor man's hospice, composed of chambers enclosing a common-room, fronts the guest-house. To the west and south were farm-buildings and workshops. The hospice for stranger monks had a common room and a dormitory. The guest-house comprised a large refectory, sleeping chambers, stables, servants' rooms, and domestic offices. The almoner's rooms were on the north-west side, those of the porter on the south-west of the church. The outer school, to which a master's house was attached, contained a large room, parted by a screen, and opening on the bed-rooms of the scholars. The infirmary and novices' house each comprised a cloister, refectory, dormitory, and a chapel, which separated the two courts. The abbot's lodge, of two stories, contained in the base tier his sitting and bed-rooms, under his solar and oratory. The servants' house was detached. Between the church and the cellarage were the parlour and vestibule for the reception of visitors, and giving orders to servants. In the sacristy the lower story contained presses, chests, and the altar plate; the upper room held the vestments, and communicated with a room used for baking the sacred bread and preparing the consecrated oil. The library stood over the scriptorium, which was provided with desks. Under the dormitory, from which one staircase led into the transept and a second to the cloister, was the common-room, with a fireplace, and connected with the bath-house. The refectory was provided with a vestry for the ordinary robes of the brotherhood. The abbot's triclinium stood at the top of the room; the brothers sat along the side walls on benches; the guests' table occupied the centre, and faced the reader's pulpit. The kitchen and buttery communicated with this room.

The earliest plan extant of an English monastery (Lenoir, i. 28; Hasted's Kent, iv. 259) is that of Canterbury, made c. 1130-74. It embraces in the cloister court, which was on the north of the church, a chapter-house on the east, with the dormitory in a continuous line with it, the refectory on the north, and on the west the cellarage and store-rooms. Behind the refectory was the kitchen, southward of a second court, in which the guest-house was on the west, the parlour on the north, and on the east a gate. To the east of the dormitory was a cloister ranged round a herbary garden, and connected with the infirmary, which lay again to the eastward. The court-gate adjoined the guest-house, forming the principal entrance. In the herbary court the prior's lodgings were on the east; and to the north of the bakery, granaries and offices, which occupied another court.

At the close of the twelfth century Clairvaux, Cistercian (Viollet le Duc, i. 269), had the following plan:—A cloister on the south side of the church, with a lavatory; on the east side of the garth the sacristy, preceded by a little library next the south transept, with the great library above it approached by stairs out of the transept; the chapter-house of three alleys, with the parlour and old abbot's lodge extending southward under the dormitory; on the south side the parlour, the refectory of three alleys, and kitchen; on the west side, but detached, the cellarage; on the south-east of the choir was a small cloister, with carols for the copyists in the north alley, and a large hall for conference on the south. To the east again were the infirmary and novitiate, and more to the southward were the abbot's lodge and infirmary cloister. The stables were on the north-west side of the church. At Citeaux, the mother of the

* Viollet le Duc, iii. 465; Durandus, iv., c. xxiv.; Hier. Angl., p. 66.
† S. Chrys. t. viii. p. 354; Lact. de Opif. Dei., c. viii.; Fortunatus; Carm., ii. p. 11.

* Jour. Arch. Ass., xiv. 97; Canute's Ecc. Can., 2; Aldhelm's Trans. Ps. lx. 9, xciv. 22.
† Proc. Ass. Soc., i. 177, 293; Churton's Monastic Remains; Schayes, iii. 134; Viollet le Duc, i. 282, 253, 279, 302, 305, 469; iii. 469; Lenoir, ii. 197, 201.

order, the arrangements were much the same. A little chapel adjoining the gate, to which the abbot conducted all guests before entering the monastery, and a stable conveniently adjoined it. The great cloister contained the cellarage on the west, slightly detached by a passage, with the guest-house and abbot's lodge to the southward; on the south were the kitchen, the refectory, and parlour; on the east the dormitory, chapter-house, and sacristy; in a second cloister to the east was the library above the carols of the copyists at the north, and the infirmary on the east. Pontigny had its cloister on the north, with cellarage of two alleys, and the rooms of the conversi above; on the north the refectory, kitchen, and calefactory; on the east the sacristy, chapter-house, novitiate, and wine and oil presses; on the west of the church were the abbot's lodge and guest-house. The cellarage was on the west at Vaux de Sernay.

The Clugniac Monastery of St. Martin-des-Champs has its cloister on the north side; the refectory and parlour on the north; cellarage on the west; the sacristy, chapter-house, and large halls, under the dormitory on the east; a detached Lady-chapel on the north of the choir, the small dormitory running parallel to it, more northward. At St. Geneviève the refectory is on the west, with the kitchen on the south. At St. Germain-des-Prés the refectory is on the north, the chapter-house on the east under the dormitory, and the cellarage on the west.

*Cloisters.**—The Eastern monasteries had an enclosure, round which the houses of the community were ranged, and connected by a colonnade, as at Sta. Laura, Mount Athos, and St. John's, Constantinople. But in the West, where the churches were of far larger dimensions, and frequented by women, a different arrangement was inevitable. There were ordinarily two cloisters; the common, or great court of the religious; and the smaller or private court, used for conversation, by the copyists, for the residence of the abbot and dignitaries, and adjoining the library, cemetery, and infirmary. At Abingdon the earliest cloister was a mere enclosed space within walls (Chron. Abingd., ii. p. 272); that of St. Cuthbert, at Durham, was circular; while in the reign of Charlemagne, St. Angilbert gave a triangular form, for symbolical reasons, to the court of Centula, which contained two chapels of SS. Mary and Benedict. The cloister appears to M. de Caumont (Abec. Arch. Civ. 4), and Fleury, to have been framed on the model of the peristyle of the Roman city house; the outer or farm court on that of the country villa. The triclinium reappears in the refectory, in the garth the xystus; the church in the atrium; and the exedra in the chapter-house; the kitchens and lesser rooms, hospitium, hybernaculum, tablinium, &c., preserve their original position in the monastery; the walled park, gardens, servants' and store rooms are equally familiar features to the classical student.

Cloisters were originally built of wood; until the twelfth century, and even at a later period, a timber roof was employed, and the corbels which supported it remain at Beaulieu, and in other places. The cloister is mentioned by Brakelond, c. 1173. It is wanting at Fountains, Kirkstall, Jorevalle, Stoneleigh, and Wroxhall. In the thirteenth century, alleys surrounding the garth are found at Salisbury and at Peterborough; and in the fourteenth century at Norwich; Wells, Chester, and Chichester, and Hereford had only three alleys. The cloister occupied the north side at Canterbury, St. David's, Chester, Gloucester, Buildwas, Milton Abbas, Sherborne, Tintern, Paris, Noyon, Rheims, Rouen, Beauvais, Seez, Bayeux, Puy-en-Velay, Cartmel, and Magdalen College, Oxford; and on the west at New College, in the same university; on the north of the choir at Lincoln; and on the south of the choir at Rochester. In cathedrals the bishops often took the south side as the best, and left the northernly to the canons. The church invariably formed one entire side of the cloister, which nearly always was to the south in northern countries, in order to secure as much sunshine as possible.

The cloister-close in Cathedrals was surrounded by the houses of the canons. In the twelth century the canons built private houses round the close (Viollet le Duc, iii. 410; Lenoir, ii. 495; Schayes, iii. 133; Monasticon, vi. 39, 141). It must be borne in mind that Winchester, Canterbury, Durham, Norwich, Rochester, Worcester, Chester, Gloucester, Peterborough, and Westminster, continued to be Benedictine abbeys, and Bristol, Oxford, and Carlisle as Austin Canons' houses, until the reign of Henry VIII. In the former, out of deference to the bishop, the superior bore the name of prior, and not of abbot. At Ely the bishop occupied the abbot's seat. With the exception of St. David's, the Welsh, the Irish, and Scotch cathedrals, and collegiate churches, as Lichfield, Ripon, Manchester (Jour. Arch. Ass., vi. 191); Wimborne (Mayo's Wimborne, 1860), Beverley, Lincluden, Perth, Southwell (Jour. Arch. Ass., viii.; Arch. Inst. Lincoln, 214), York, and Wolverhampton, had no cloister. Maidstone (J. Whichcord's Maidstone) preserves its collegiate arrangement. The capitular buildings included a chapter-house, refectory, cellarage, schools, a vicar's close, as at Hereford and Wells (Jour. Arch. Ass., xiii. 34), library, audit-hall, bursary, prison, and tribunal.

The common monastic arrangement was the following:—On the north were two doors into the church; on the east of the great cloister were the sacristy, chapter-house, and the calefactory, with the dormitory, approached by a separate staircase above them; on the west were the cellarage and store-rooms and the guest-house; on the south, fronting, but thus removed as far as possible from the church, to secure it from noise and the smell of dinner, was the refectory, connected with the kitchen. Such is the description given in some old Latin verses preserved by Du Cange; and the arrangement is found towards the close of the eighth century at St. Wandrell's, Fontenelle, Upper Normandy; and at Beauport, Côtés du Nord, at the commencement of the thirteenth century. Boyle and Netley present the anomaly of a wall and gate occupying one side of the great cloister.

In the north alley at Beaulieu, Melrose, and Gloucester, the carols of the monks, recesses for copying books still remain. In the foreign abbeys they were usually in the smaller cloisters. In Cistercian houses this alley was appropriated to moral collations or lectures. Peter de Blois says the west side was allotted to the novices, and the east walk to prælections; the latter were selected from profane authors. Lanfranc mentions that the cloister was designed for conversation at certain hours of the day. The Benedictines used the cloister, and the Carthusians, Cistercians, Trappists, and Carmelites the garth, for interments. The cloister was under the control of the prior, sub-prior, and several other officers. It is observable that at Winchester, until a recent period comparatively, the scholars in summer time studied in the cloisters. In the centre of the garth, which was planted with trees and flowers, was generally a fountain, and sometimes a pulpit used in the festival of All Souls.

*The Chapter House.**—It was so called, according to Papias, because the rubrics of the statutes of the order were daily read over to the monks in this room. In the ninth century the alley next the church was used as a chapter-house. In 966, Herleve, wife of Duke Robert of Normandy, built a separate chamber for the purpose at Fontenelle. Edward the Confessor built "a vaulted and round" chapter-house at Westminster (Vit. S. Edw., Publ. Rec. Comm. l., 2309). In the twelfth century one in the form of a parallelogram was built at Bocherville; a square or oblong is found at Buildwas, Castle Acre, Shrewsbury, Wenlock, Stoneleigh, Glastonbury, St. Mary's (York), Oxford, Bristol, Chester, Exeter, Gloucester, and Dunkeld. From the commencement of the thirteenth century a polygonal shape was adopted, and of this and the following century we find a decagon at Lincoln, Bridlington, and Lichfield; and an octagon at Westminster, Howden, Kenilworth, Cockersand, York, Sarum, Elgin, Pluscardine, Thornton, and Wells; and a round at Worcester. It is two-storied at Glasgow. In the thirteenth century it was sometimes divided into aisles; there are two at St. Pierre-sur-Dives, Dadeix, and Kirkstall; and three at Tintern, Netley, Fountains, Beaulieu, Jorevalle, and Buildwas. It was in this country probably a Cistercian; and certainly, as it is found at Fontenay at the close of the twelfth century, a French arrangement which was followed in Belgium (Schayes, iii. 134). At Wells and Westminster it is built above a crypt; it stands on the north side of the church at Wells. At Dunblane it occupies the east end of the north nave-aisle. It was provided with a stone bench along the walls, and with a seat for the abbot at the east end. Occasionally a chapel was adjoined, as at Batalha; and the apsidal termination found in the House of the Jacobins at Toulouse, Reading, Llanthony, Durham, Ripon, Haughmond, and Norwich may have served for a similar purpose. The chapter-house chapel at Tongres retains its stone altar (Schayes, ii. 148). As it was the place of judgment on refractory monks, cells (Proc. Ass. Soc., ii. 289) are sometimes found adjoining it, as at Durham and Norwich. It was regarded as inferior only to the church in its sacred character, and a light not uncommonly burned perpetually in it. Bishops were interred in it at Durham, and persons of distinction at Gloucester. It frequently had two large openings on either side of the west door, as at Combe, Haughmond, Bristol, and Beaulieu, to admit light, and to enable the priors and monks of dependent cells to take part in the proceedings on important occasions. It is approached through a vestibule at Chester, Bristol, St. Mary's (York), and Kirkstall; and by a passage at Wells, Southwell, York, and Lichfield; at Belvoir (Nichols's Leic., ii. 80) it stood in the centre of the cloister.

The *Slype* was a narrow passage between the transept and the chapter-house, which occurs in the Benedictine houses of Winchester, Gloucester, Durham, Finchale, and St. Alban's, where it led to the monks' cemetery. Its place is supplied by the *Sacristy* in Cistercian houses. It occurs in the Clugniac convent of Bromholme, and in that of Austin Canons at Newstead.

The *Dormitory** invariably adjoined the church, as the monks had, on the mornings of certain festivals, to sing matins at an early hour. For this purpose the Cistercians constructed a staircase out of the south transept leading to the dortor, and it usually extends in their houses over the chapter-house. It appears in the same position at Beleigh (Præmonstratensian). The ordinary position was the east side of the cloister, as in fourteen abbeys of France mentioned by M. de Caumont; but it was built on the west at Durham, Chester, Worcester, Shrewsbury, Lacock, and St. Alban's, by Benedictines; at Fountains, Kirkstall, and Rievalle, by Cistercians; at Hexham and Thornton (Proc. Ass. Soc., ii. 149; Arch. Jour., ii. 357), by Austin Canons; at Leiston and Eastby (where it is of two alleys, and detached) by Præmonstratensians. At Thoronet and Senauques it is over the east walk of the cloister. It occupied at Crowland the east side of a second court, in which the refectory was to the north, the granaries being on the south-west, and the guest-house on the south. Cellarage is frequently found under the dormitory, as at Westminster, Durham, and Sherborne, St. Mary's (York), Finchale and Shrewsbury (Benedictine), Bromholme (Clugniac), White Friars, Coventry, Thornton and Bolton (Austin Canons), Kirkstall, Rievalle, and Furness (Cistercian). One portion of this substructure was the *calefactory*, a chamber warmed with a stove or long heating-pipes, serving as a place to provide fire for the censers, and warmth to the monks in cold weather; the chapter occasionally met here. There were two at St. Gall, one for the brethren, and a second for the sick and novices. The dormitory stood over the south aisle at Wenlock and Wymondham. Twelve monks slept in the rood-loft at St. Alban's, as watchers. The beds were ranged along the walls under the windows: the abbot, by the Benedictine (r. xxii.), Clugniac, and Austin Canons' rule, slept in the centre of the room. The cellarer then only had a separate chamber; but in later times the abbot or prior possessed his lodge, and the dortor was subdivided into separate cells, with doors made three-parts of trellis-work, so that the chief official could exercise a supervision of the whole. This plan was advantageous for silence, retreat, and devotion; and it is found in 1370 at Noyon, and, a century earlier, in the Black Friars, at Gloucester (Gent. Mag. 1860, p. 340), where the cells had stone partitions. A lamp burned all night in the dortor. At Tykford (Monasticon, v. 206) there were five cells. The dormitory of the conversi remains at Wenlock (Clugniac), (Potter's Mon. Rem.).

The chamberlain had charge of all the beds and furniture in a convent. The monks took their meridian (Monast., ii. 230) and changed their shoes before and after prayers in the dortor by day; in cold weather, when the spring in the cloister was frozen, they used hot water in the dormitory; an additional reason for building the calefactory at no great distance from it.

The *Refectory*† ordinarily occupied the south side of the cloister, for reasons already assigned. At Sherborne, an exceptional case, it is to the west. Of course, where the cloister was on the north of the church, the refectory was on the north, but still almost invariably fronting the church, with Præmonstratensians, Benedictines, Cistercians, Clugniacs, and Austin Canons. The other deviations from the rule are at St. Augus-

* Lenoir, ii. 298; Ducange, ii. 386; Fosbrooke, Brit. Mon. Ch., xxxviii.; De Caumont, Abec., 26; Viollet le Duc, iii. 408.

* Fosbrooke, Brit. Mon., ch. xxxvi.; Ducange, ii. 150; Lenoir, ii. 320.; De Caumont, Abec., 34.

* Fosbrooke, Brit. Mon. ch. xxxvii., xlv. Ducange, ii. 923; Lenoir, ii. 360.; De Caumont, Abec., 38.

† Fosbrooke, Brit. Mon., ch. xxxv.; Ducange, v. 650 Lenoir, ii. 241, 328, 340; De Caumont, Abec., 41, 84.

tine's, Canterbury, where it was on the east; at Jorevalle (Cistercian) on the south-east, beyond the dormitory; and on the west in the Black Friars, Gloucester. In the House of the Bernardines at Paris, at Netley, Furness, and in the Marvel of Mont St. Michel, and apparently at La Luzerne, the refectory was below the dormitory. It was above a cellarage at Dunfermline, Battle, Reading, Beauport, Sherborne (Benedictine), Eastby and Leiston (Præmonstratensian), and Kirkstall (Cistercian). At Clairvaux, Savigny, and Bonport, at Tynemouth, Fountains, Vaux de Sernay, Beaulieu, and Rievalle, it stood north and south, at right angles to the cloister. The wall pulpits, which fronted the guest table, remain at Chester, Eastby, Beaulieu, Shrewsbury, and St. Martin des Champs, and were used by the reader of holy books during dinner. At Winchester College to this day the Gospel is read at election dinner. The pulpit of St. Laura, Mount Athos, is of wood. The refectory of Fountains, Netley, Eastby, Villers (Schayes, iii. 40) in Belgium, and St. Martin des Champs, has two aisles; those of St. Mary's, York, the Bernardines, at Paris, of the fourteenth century, and of Alcobaça, have three. Mural paintings enriched the refectory, as at Villers, Clugny, Fontenelle, Luxueil, St. Germain de Flaix, St. Michael, Antwerp, and St. Martin's, Dover. Leonardo da Vinci painted his "Last Supper" for the refectory of St. Dominic, at Milan. Adjoining the refectory was the toregma, or dresser, for cups, plates, &c. In the ninth century the refectory was sometimes apsidal; and the early form of the Eastern refectory, and those of Parenzo, with three apses; and St. John Lateran, built by Pope Leo III., was an imitation of the Roman triclinium. (Lenoir, ii. 329). At St. Laura, Mount Athos, the refectory is in the shape of a Greek cross.

There were four kinds of refectory:—1. The summer. 2. The winter (as at Villers and St. Bertin's, St. Omer). 3. That of conversation; and 4. The misericord, for eating flesh meat (Fosbrooke, Brit. Mon., ch. xlv., xlviii.; Ducange, s. v.; Monasticon, v. 206). At Tynemouth, we find a common hall on the west, and the new hall on the south of the cloister (Monast., iii. 311).

The *Kitchen** was, of course, an indispensable adjunct of the refectory, and invariably adjoined it, although, as at Durham, it occasionally stood behind it; its ordinary position was on the side. There were two—one for the convent, and a second for the infirmary. Our statements refer to the former. That of Marmontier was shaped like a bottle; those of St. Florence Vendome, Saumur, Villers, and St. Pierre de Chartres (thirteenth century) were round; those of Pontlevoy, Fontevrault, Durham, and Glastonbury, were octagonal; and those of St. Ouen at Rouen, St. Gall, and Fountains, square. The kitchener took charge of the butchery and fishponds; and the hebdomadarius presided over the kitchen, catering for a week, each monk taking his course in turn. The kitchen of Fontevrault had small apses in each face.

The *Lavatory* is found in the thirteenth century near the refectory of the Génovéfins at Paris and at Clairvaux, and in the south cloister walk at Westminster, Wells, Chester, and Gloucester; at Durham it was a detached building in the garth, probably built over the spring, which formed the first simple lavatory. Near the lavatory is often found a long aumbry for the towels.

The *Cellarage* usually formed the west side of the cloister, and sometimes joined the guest-house. A magnificent substructure of two aisles remains at Vincellottes, Fountains, and at Beaulieu: the cellars included granaries, beer, wine, and oil vats. On this side were the guest-house at five French abbeys mentioned by M. de Caumont, and magazines at seven others, also described by the same distinguished author. They were usually vaulted and divided into aisles: a good specimen remains, but on the east side of the cloister extending southward, of the time of Edward the Confessor, at Westminster; inferior, however, to the grand buildings of Vauclair and Eberbach. The same purpose was served by the large granges, buildings divided into three aisles, as at Ardennes, Maubisson, and St. Vigor, for the convenience of having one alley free for the passage of carts.

The *Treasury*,† sometimes called also the revestry, was generally near, or, as at Westminster, below the dormitory; sometimes near the choir, as at Canterbury; in the transept at Chichester; and there is frequently a deep recess in a crypt, to hide the sacred plate in time of danger, as at Canterbury. At Clermont, Limoges, and Narbonne, the treasury and sacristy occupy two of the choir chapels.

The *Exchequer** derived its name from the chequered cloth divided into squares, for the convenience of casting up accounts. With the offices of the chamberlain and cellarer, it ordinarily stood in the great court, adjoining the cross round which the conventual market was held.

The *Library*† at St. Gaul was over the scriptorium and adjoined the Presbytery, and was generally placed towards the north to preserve the contents from insects. Those of Wells and the Grey Friars, London, were of considerable length. At Septuagesima an inventory was taken. It is next the slype at Finchale; south of the choir at Wimborne; over the chapter-house at Dunfermline, Eastby, and Lichfield; and in an upper room near the south transept at Westminster, and near the north transept at Hereford.

The *Scriptorium* (Lenoir, ii. 374; Fosbrooke, Brit. Mon., ch. xliv.) was usually in the cloister or adjoining the church, but in the foreign Cistercian houses in the second or inner cloister; the precentor had the charge and furnished materials to the librarii, who made new books, and the antiquarii, who copied or repaired the old books.

The *Archive* or *Muniment-room* (Lenoir, ii. 69, 375) was sometimes over the church-porch, as at Peterborough and Fontenelle; in the south-western tower at Clugny, where the north-western was the prison; in an isolated tower, as at Martin-des-Champs and Vaux de Sernay. It contained the matriculation lists, chartularies, terriers, and registers. The provost kept the key. It was occasionally built over the sacristy; it is near the south transept at Chichester, and is of large dimensions, adjoining the choir at Salisbury.

The *Parlour* (Fosbrooke, Brit. Mon., ch. xli.; Ducange, iv. 142; Lenoir, ii. 327), common or reception-room, where the monks gave directions to the servants, traded with merchants, or conversed with friends, adjoined the gate or the refectory; it was on the east of the cloister at Clairvaux, St. Mary's, York, Walsingham, Beaulieu; on the north at Clugny; on the south at Fountains and Citeaux; south-east at Shrewsbury; west at Durham; north-west at Newstead. The Cistercians had three parlours; (1) for visitors; (2) for conversation; (3) for confession.

The *Abbot's* or *Prior's Lodge* is called the palace in the plan of St. Gall. Suger, in the twelfth century, and the prior of Canterbury before 1120, lived in a single lodge. In the ninth century it was a large building at Fontenelle; at Pontigny it contained four rooms; at St. Gall it consisted of a mansion, including a bed-room and solar, and servants' offices, kitchen, bath-room, and cellar. It often was provided with a chapel, as at Ely. It adjoined the church usually in Benedictine houses, was detached by Cistercians, and by the Austin Canons was connected on the west side of the cloister with the nave, generally on the south-west by a staircase, and adjoining the novices' hall, as at Haughmond, &c. It was on the south-east of the cloister at Durham, Kirkstall, Leiston, and Newstead; on the south-west at Westminster, Crowland, Hulne, and Bridlington; on the east at Shrewsbury, on the north at Sherborne, on the north-west at Tynemouth, on the south at Finchale, and north of the north transept at Eastby and Castle Acre; on the north-east at Wenlock, and of two stories.

The *Infirmary*‡ was among the Cistercians a large hall for exercise, with separate cells like a dormitory, as at Ourscamp, near Noyon, founded 1130. At St. Gall it contained a chapel, dormitory, refectory, and consultation-room, standing to the north behind the church, and ranged round a cloister. In England it was on the east of a small cloister, and furnished with a hall and chapel at Canterbury, Westminster, and Gloucester; south-west of the nave at St. Alban's; detached on the south-west at Hulne and Shrewsbury; west of the dormitory at Durham and Worcester; south-east of the cloisters at Castle Acre and Peterborough; and on the east at Rievalle, Binham, and Bridlington.

The *Guest-house*§ was usually near the gate. One was built at Fontenelle at the close of the seventeenth century. It was not always a detached building, and frequently formed a hall, of two alleys at Beaulieu and Fountains, with bedrooms opening off it. At St. Gall, in the ninth century, it consisted of two large buildings, with every convenience and servants' rooms. At St. Alban's it was an enormous range of rooms, with stabling for three hundred horses. It was on the west side of the cloister at Fontenelle and St. Germain-des-Prés, at Newstead, Beaulieu, Eastby and in the Norfolk Houses (Harrod's Gleanings); on the west of the great court at Durham, Finchale, and Eastby; on the north at Tynemouth and Bridlington; over the great gate at Thornton; south of the cloister at St. Alban's; south-east at St. Mary's, York; east of the chapter-house, Worcester; south of the refectory at Shrewsbury; detached southward in the great or outer close at Furness and Hulne; north-east of the cloister at Tintern; on the north, over cellarage, at St. Martin's, Dover; and parallel to the refectory at Glastonbury (Collinson's Somerset, ii. 263). The Hospice, called Salle des Gardes, remains at Caen.

There were also guest-houses for travelling religious, and the poor, and pilgrims.

*The Tribunal, or Court-house, and Prisons.**—The tribunal and prison usually adjoined the great gate, as at St. Stephen's, Caen; or occupied the chamber above it, as at St. Alban's, Tewkesbury Westminster, Malling (Mon., 118, 383), Hexham, and other abbeys. The dungeon is under a tower at St. Gabriel Calvados; near the transept at Berne; on the south of the chapter-house at Durham; at Clugny it had neither stair, door, nor window; at St. Martin des Champs was subterranean; and at Hirchau barely permitted the prisoner to lie down.

Other Buildings.—The gate-house was sometimes provided with a chapel in the upper story. A charnel was a frequent adjunct to an abbey, with a chapel over the carnary. The novices and choristers had a separate building and inner school. Glastonbury and St. Victor, and other houses, furnished seminaries or public schools, held in the outer school, usually divided by a screen or wall, to mark distinction of rank or attainments: besides these were the almonry, surgery, dispensary, herbary, industrial buildings, and workshops, mills, stalls, and stables, barns and sheds for agricultural produce and implements; while Hulne exhibits all the features of a fortified position, and others had on the coast, as at Furness, watch-towers. Battle has a fortified gate (Lenoir, i. 77; De Caumont, Abécédaire, 178). Strong walls still remain at St. Stephen's, Caen, and St. Germain Auxerre; and forts defended the abbeys of Montpeyraux and Condat. In the thirteenth and fourteenth centuries nearly all the French abbeys and Cathedrals, as at Alby, Beziers, and Narbonne, were fortified, owing to the continual wars (Viollet le Duc, i. 227, 262; ii. 376; Lenoir, ii. 491). At Cashel a castle forms the west end of the cathedral. Holy Cross, Bective, and Crossraguel were fortified. The almonry (Fosbrooke, Brit. Mon., ch. xlii.) of Westminster stood on the west side; the sanctuary occupied the enclosure on the north side of the abbey. The almonry gate of St. Stephen's, Caen, is detached at some distance on the north side. Charnels occurred at Steinen, Hereford, Hythe, Worcester, Norwich, St. Peter's-in-the-East, Oxford, Ripon, and Lynn (Gent. Mag. N.S., vii. 156).

In conclusion, the old distich informs us that the Franciscan loved the town, the Jesuit (the worst of architects) the great city, the Cistercian the valley, and the Benedictine the mountain. In England, the Benedictine was the citizen and most learned of monks; the Austin Canons, with their long-drawn aisles, were proverbial for their love of preaching and logic—the term, doing Austins, *i.e.*, disputing with these monks, was long a proverbial exercise at Oxford; the Cistercian, with his secluded convent, the educator of the poor, an eminent friend of the labourer, a class which he employed in large numbers as conversi, was a recluse devoted to industrial pursuits in works and farming; the Clugniac combined the fine arts, reading, and study, with bodily labour and agriculture; while the cells of the Carthusian at Mount Grace witness to the ascetic habits of a gloomy brotherhood; the Dominican was the preacher, eager for the development of intelligence, the champion of orthodoxy, and the devotee of philosophy; the Franciscan Minor, a name betokening all the brothers were equal by their vow of poverty, was the preacher of equality. It was a fatal error at the Reformation not to have converted their beautiful and stately houses to charitable uses, study, and prayer; but we may still glean from them all that they held of good and beneficial to humanity, agriculture, and art, and go forward ourselves with a firmer foot by retaining the lesson in our hearts; and, however widely our opinions in religion may differ from many of

* De Caumont, Abec., 44; Ducange, s. v.; Coquina; Lenoir, iii. 348; Viollet le Duc, iv. 461.
† Lenoir, i. iii. 204—292.

* Fosbrooke, Encycl., 241; Ducange, vi. 84
† Lenoir, ii. 371; Fosbrooke, Brit. Mon., ch. xlii.
‡ Lenoir, ii. 389; Fosbrooke, Brit. Mon., ch. xxxix.
§ Fosbrooke, Brit. Mon., ch. xi.; Ducange, iii. 706; De Caumont, Abec., 43, 165; Lenoir, ii. 396, 400.

* Fosbrooke, Brit. Mon., ch. xlv.; De Caumont, Abec., 115; Lenior, ii. 430; Ducange, ii. 173, 752.

the tenets of those who built them, we shall do well to remember that in their sacred enclosures lie buried the enmities of many generations.

ON ACOUSTICS.*

THE subject to which I venture to invite your attention is that of acoustics, or the science of sound; in reference (of course) to its bearing on the arrangement and construction of those buildings where the free transmission of sound is of importance.

It will not, I think, be deemed necessary that I should advance any apology for the subject itself. The proper construction of buildings intended for music or public speaking, is a point of vital interest to every architect, as under this category may be comprehended all the more important works that come into our hands; and such buildings (however excellent in other respects) cannot certainly be said to have fulfilled the design with which they were erected, unless they have been made favourable to the easy transmission of sound. A knowledge of the laws that regulate this transmission, and of the methods necessary to bring a building into conformity with those laws, is then most desirable to us.

A very considerable time has elapsed since a paper on this subject was read before the Institute; and this consideration, coupled with the fact that even such books as exist on the subject are not generally known, induces me to hope that it may be possible to lay before you some already-ascertained facts of interest, but which are not so familiar as they deserve to be.

I must disclaim, however, the ability to present anything new, in any other sense than the one just indicated. The subject has always occupied a share of my attention as a reader, but not as an experimental philosopher; and latterly, it has become my duty to search very thoroughly for all accessible information that relates to it, and it has been the difficulty of collecting scattered facts, and of obtaining even the titles of books, that has principally made me feel that an account of the books and other sources of information accessible, and a condensed exposition of the most important points to be gleaned from them, might be of use to others.

In the commencement of an inquiry into the laws governing the distribution of sound in buildings, a student would naturally seek information on the nature of sound and the laws of acoustics, from treatises on physical science. The works best worth consulting are the following, and I name them now, to avoid interrupting the main subject afterwards:—

"The Treatise on Sound," by Sir John Herschel, published in the "Encyclopædia Metropolitana," and since issued separately. This is the best work on the subject in English; but it has the drawback that it does not contain any account of the discoveries of the last thirty years, having been published in 1830.

Mrs. Somerville's "Connection of the Physical Sciences."

Detached Papers by Professor Wheatstone.

The article "Acoustics," in the "Encyclopædia Metropolitana."

Arnott's "Elements of Physics."

Brewer on Sound.

"The Cours de Physique" of Mons. Biot.

"Cours de Physique" of Pouillet.

"Traité d'Acoustique," by Chladni; a standard work; also published in German.

And the writings of Savart and Biot, and others, published in the "Annales de Physique et de Chimie," and the lectures of Savart, reported in "l'Institut."

On the special subject of buildings, we have, published in England,—

Saunders on Theatres.

Wyatt on Theatres, quoted in "Gwilt's Encyclopædia."

Inman's abstract of evidence connected with the rebuilding of the Houses of Parliament.

A considerable number of papers scattered through the *Builder*, from 1846 to the present day, especially those by Mr. Scott Russell, before the Royal Society and this Institute, in 1847, and a few small pamphlets and incidental notices in books on other subjects. It is right to add that this is not a complete list, but only a selection.

Published abroad, we have,—

"Lachez sur l'Optique et Acoustique des Salles de Réunion Publiques," a very practical and sensible little book.

"Rhode, Theorie der Verbreitung des Schalles für Bunkunstler," a small but very valuable pamphlet.

Observations by Chladni in his book, and in contributions to the "Allgemeine Musikalische Zeitung;" and a few other papers and books.

I am, moreover, informed that a French work of great value on this subject exists, different from any of these, but the title of which I have been unable to learn.

From almost any one of the first-named books a general knowledge of acoustics can be obtained; and if we make an attempt to sum up briefly what is known about sound, leaving out, as not essential to our present purpose, both the refinements of mathematical calculation and the elegant results of experiments on undulation, vibration, the pitch of musical notes, and other departments of the science, we arrive at a few definite results of philosophical inquiry which can be briefly stated, and will be enough for the present purpose.

Sound, then, may be regarded as motion made sensible to our ears; and the sense of hearing as a very refined sensitive and delicate sense of *touch*. A moment's thought will suffice to remind you, if this description seem at first sight startling, that there is *no* sound unaccompanied by motion, that there is but very little motion without audible sound; and lastly, that if motion exist, but be so cut off from our ears that no communication can take place, we hear no sound.

Sound is not, like light, conveyed through an imponderable medium; it, on the contrary, travels through all the substances, solid, liquid, and aëriform, that surround us; and it is precisely that class of substances best suited to convey motion, which forms the best conductors of sound; while those bodies that deaden and destroy motion, deaden sound also. For example, a rod of elastic wood, or of iron, will convey readily any motion, from one end of it to the other, and such a rod forms one of the best known conductors of sound.

A heap of sand will, be it only thick enough, check the force of the most powerful cannon-ball, and, were there no means of hearing *round* it, such a heap would equally deaden the report of the cannon; unless, indeed, the air lurking between the grains of sand conveyed some faint impressions to the listener.

We are, however, more familiar with the atmosphere as the conductor of the sounds that reach our ears than with any other medium, and as it is through the atmosphere alone that the sounds heard in large rooms are transmitted, we shall have little occasion again to refer to the conducting properties of other media.

The atmosphere, under favourable circumstances, will transmit to great distances any agitation that is roused in it. As an instance of this we may refer to the experiments of M. Biot. This gentleman having an opportunity of operating with a very long cast-iron pipe, forming part of an aqueduct in course of construction at Paris, found that even when the pipe was 1,040 yards, or more than half a mile long, the explosion of a pistol fired into it at one end would blow out a candle at the other, and that the lowest whisper at one end was as distinctly audible at the other as to the speaker himself. This experiment succeeded better at night than in the day-time.

Although, however, the air in a tube where any lateral escape is impossible shows this marvellous sensitiveness, we do not find a similar result from speaking in open, unconfined air. It is a matter of familiar experience that sound under these circumstances decays and dies away, till at last it ceases to become audible. This decay is only the natural consequence of the fact that the original force is constantly spreading through a wider and wider space, and is getting (so to speak) diluted.

A familiar illustration to you all will be the gradually widening circles that spread on the surface of smooth water from a spot where you drop in a pebble, and which, weakening as they widen, at last fairly vanish into the flat unbroken lake.

The analogy between the progress of sound and that of water-waves thus roused is, however, less complete than is ordinarily supposed, for it usually happens that, from the first, sounds have an *initial* direction impressed upon them, and that they travel further in this direction than in any other. The most familiar instance to us all is that of the human voice, which is always heard very much further in front of the speaker than it is at his sides or behind him. The human voice is not, however, an exceptional case; it is well to know that the larger number of sounds have something of this propensity. A good example is a tuning-fork: when the sound of this is excited it will be audible to a much greater distance square than cornerwise; that is to say, you will hear it better if the ear is in a line with the two arms, or in a line at right angles to one joining the two arms, than it will if the fork is turned a quarter round, so that a line joining the two arms would be at an angle of 45° to one drawn from the ear to the fork.

The decay of sound is very much prevented not only by any initial direction it may receive, but also by any accidental circumstance that prevents the agitations in the air from spreading laterally, even if it be only one side that is confined. Thus sound will travel a long distance along the ground, and it will be very audible along a wall, because the angle formed by the wall and the ground forms two sides of a sort of tube, and thus prevents part of the lateral escape. There is an instance of this sort recorded in Dr. Hutton's Dictionary, that has been often quoted: a garden wall exists in Dorsetshire that will, he states, convey in this way a whisper 200 feet, without loss of distinctness.

Sound in an open atmosphere travels in a straight line; should it, however, encounter an obstacle, or pass the limit of any boundary, it always spreads to some extent behind that obstacle or boundary. For instance, in a church an auditor exactly behind a stone pier and close to it will probably hear worse than if nothing were between him and the clergyman; but still, even close to the pier he will hear; and, if keeping always the pier between him and the speaker, he moves further back, he will soon reach a point where he will hear as well *with his ears* as if there were no obstacle. I use the words "with his ears" advisedly, because the eyes always assist us in our attention to public speaking, and, of course, this assistance would be lost in the situation I have supposed.

Sound, when it encounters an obstacle directly opposed to it is, however, beaten back, or reflected; the phenomenon of echo is familiar to all, and is the result of such a reflection, sending back the sound from a considerable distance. It was laid down by Mr. Scott Russell, in the paper read by him before you on this subject, in 1847, that in the case of sound, the movements of which are closely allied to water-waves, reflection does not take place except where the wave impinges on the obstacle at an angle greater than about 30 degrees.

Where the angle is less than this, the sound does not again leave the obstacle, but simply runs along the face of it,—in fact, is conducted along it, in the manner we have just had occasion to mention. All, or almost all, whispering galleries are examples of this conduction, that at St. Paul's being a very good one.

Should the angle, however, at which the sound falls approach nearer to a right angle, it will be reflected back, and will follow the same law as the reflection of light; that is to say, the angle of reflection will equal the angle of incidence, so that all sounds to be heard, as echoes by the speakers, must fall on a reflecting surface exactly at a right angle, and if a sound reaches any surface at an angle of, say 45 or 60 degrees, from the right, it will be thrown off at the same angle, 45 or 60 degrees, but to the left.

It will be familiar to all that there are some echoes that can repeat one syllable, some two, some three, and so on, simply because in the one case longer time elapses than in the other before the echo gets back; and it will always be found when the sound takes longer time to make its journey to the reflector and back, it is because it has had a greater distance to go over. From this we gather that the speed at which sound travels, rapid though it be, is not so great but that the effect of even a moderate addition of length is quite perceptible in the longer time it takes to reach the ear. In this particular sound differs from light and electricity, which travel so fast, that unless with great distance, the time they consume in going cannot be detected.

The speed of sound in the atmosphere varies with the greater or less density of the medium. It has been very frequently measured, and Herschel gives, as the results of the best investigations, that sound in dry air at the temperature of 62 degrees travels over 9,000 feet in eight seconds. This statement is easily remembered, but it may be useful to add that 9,000 feet, or 3,000 yards in eight seconds, equals 1,125 feet, or 375 yards in one second, or 12¾ miles in a minute.

As a practical application of this fact, I may extract from the same author the remark, that if music were performed in a room 53 feet long, with an echo in the extremity, each reflected note, should

* Read by Mr. T. Roger Smith, as elsewhere mentioned.

there happen to be a passage with as many as ten notes in a second, would exactly interfere with the following note sounded by the musician. Passages as rapid as this constantly occur in modern music, and it is not a very uncommon thing to hear them thus spoiled.

The varieties in the nature of sounds are very great. Thus we have music, articulate speech, and noise; we have variations of pitch, of quality, of loudness, of volume, of intensity, and of distinctness. We have in music combinations of sounds in succession to form melody, and simultaneously as harmony; and of sounds heard together, we have some combinations that are harmonious, and some that are discordant.

As an illustration of some of these peculiarities, let us suppose the string of a harp struck and left to sound. We hear a long, definite note gradually dying away, but which, faint though it becomes, still retains its pitch. If, now, we examine the harp-string, we find it constantly vibrating to and fro with great rapidity; as it gets to rest, its excursions on each side of the line of repose grow shorter and shorter, but they neither become more nor less frequent than when they were most violent. It is clear that each movement of the string must rouse a movement in the air, in fact, strike a blow upon it; and we begin now to trace some connection as likely to exist between the regular recurrence of these blows and the equable pitch of the note the string gives out, and also between their diminishing vigour and the fading loudness of the sound. It is, in fact, as I dare say you all know, the regular recurrence of distinct impressions which occasions all prolonged sounds, and, with one or two exceptions, this is always a consequence of vibrations. The way in which the separate shocks on the ear produced by the vibrations get fused into one sound corresponds very closely to what happens to the sight when a spark of fire is swung round so rapidly as to appear a fiery circle: the impression of the sound on the ear, like that of the spark on the eye, does not die away the very instant the exciting cause stops; and if that impression be renewed before the recollection of it has had time to vanish, the sense of hearing loses the consciousness that any intermission has taken place.

Very bright lights remain longer impressed on the eye than the image of ordinary objects, and similarly very intense sounds remain longer in the ear, and consequently fewer repetitions of them in a second are required to produce a continuous note: so that though it is impossible to hear sounds from an ordinary cord making fewer than 30 vibrations in a second; yet Savart has succeeded in making audible a sound composed of only 14 pulses, or 7 complete vibrations, in a second; and, at the other extremity of the scale, in rendering audible sounds up to 24,000 vibrations, or 48,000 pulses, per second. The greater or less frequency of the vibrations occasions the sound to be more or less sharp, and the actual correspondence between the number of vibrations in two notes determines their concord or discord when sounded together.

For example, the lowest C on a grand piano is said by Brewer,* to require 32 pulses in a second for its production; the sound most accordant with that is its *octave*, the number of whose vibrations always bears the relation of two to one to those of the original sound. Thus, in the instance just selected, 64 vibrations in a second are required to produce the C an octave above the one we started from. If the dots in the diagram represent pulses, it will be seen that when a note and its octave are sounded together, every vibration of the fundamental note coincides with a vibration of the higher one.

If G, the fifth above this C, had been substituted for the octave, we should have struck a note containing 48 pulses in a second along with the C containing 32 such pulses; that is to say, three pulsations of the higher note to every two of the lower one; and, as the diagram shows, only every other pulse of the fundamental note would have coincided with one of the upper one. This is the next most accordant interval.

The relation between a note and its major third is expressed by that of 4 to 5, or 32 to 40, so that this interval is less perfectly consonant.

Two notes the pulses of which hardly ever coincide, sounded together, produce a discord. For instance, the seventh above any note bears the relation to it of 15 to 8, and this is consequently a very imperfectly consonant interval.

Beyond just stating that all natural sustained sounds are produced by the vibrations of elastic substances, it is impossible to enter upon the very complicated and very interesting investigations that Chladni, Savart, Wheatstone, and others, have conducted upon undulation and vibration in all its forms, or to describe to you the elegant experiments by which the motions of vibrating bodies are rendered visible.

The transmission of these vibrations through the air is, however, a matter of some moment to our subject. Each impulse of the vibrating body makes an impression on the air immediately adjoining it, which impression instantly passes onwards and outwards, leaving the atmosphere behind in a state of quiescence. A wave of sound is, in fact, a state of momentary compression travelling with the speed of the wind away from its exciting cause into space; and it is accompanied by a displacement of particles, slight, indeed, but still actual, and, in fact, when the impulse has lost the power of moving the air at all it ceases to exist.

Should this wave meet with an obstacle that reflects it, it will travel back through the atmosphere to any point to which it may be directed by the reflecting body. Any agitation of the air which from circumstances, such as reflection, for example, is made to take the form of regular pulses, will, if these are but frequent enough, become an audible sound. Take a familiar instance.

Suppose that we have a pipe, of any length shorter than about 35 feet, closed at one end, and make an agitation in the air at the open end. As long as the separate movements are so far apart that the impulses leave long intervals between them, no sound is heard; but as soon as the movement is brisk enough for a pulse the moment it has travelled to the bottom of the pipe and back, to be followed at once by another, an audible sound will result, the pitch of which depends on the length of the journey each pulse has to make down the pipe and back again. If we go on making the agitation more brisk for a time, no alteration, except in loudness, will be audible, the pipe seeming, so to speak, to keep the agitation that wants to enter it waiting till the one that is there emerges.

But suddenly the sound heard will jump an octave, and we shall find, if we take the proper means of investigating, that the air in the pipe has divided itself into two vibrating lengths. Increase the agitation, and soon another jump takes place, the air in the tube dividing itself into three portions, and so on,—the points of division being termed nodes. Thus, for example, by blowing more or less violently into an organ-pipe, we can produce either its fundamental note, or the octave above that note, which is the sound proper to a pipe of half the length, or to the original pipe divided into two portions by one node, or the twelfth above, which is the sound proper to a pipe one-third the length; or to the original pipe divided into three portions by two nodes, and so on.

These divisions equally occur in vibrating strings, and it is remarkable that even where a string or a pipe is sounding the gravest note it can emit, a second set of vibrations almost invariably coexists along with the primary ones, giving out the octave, twelfth, &c. These sounds are called *harmonies* of the principal sound, and an acute ear can detect their presence constantly; perhaps nowhere so readily as in the note of a large bell.

It becomes of importance to us to know all these circumstances, if we reflect that any room may be regarded as nothing else than a great organ-pipe, in which, if a suitable agitation be roused, sounds, no doubt, will be emitted by the air. Nor is there any safeguard in the size of the room; for, although a room be too large for what would be its primary note to be audible, the harmonies of that note, some of them, will be quite appreciable; and it is the presence of these, that causes what is known as the *note* proper to a room.

As this note cannot be ordinarily avoided, the only thing to be done in relation to it, is to see that the dimensions of the room, each way, bear some simple numerical relation to one another: so that if undulations are roused that travel from end to end, and others that travel from side to side, the sounds due to the two may blend harmoniously, and not clash discordantly.

The last point to which I have to draw your attention, is the sympathetic vibrations that sounds can excite in sonorous bodies. If a tuning-fork is sounded in the air, its note is extremely feeble, but if it be rested upon a pianoforte, or a table, a marked alteration in sound is audible.

Half a dozen tuning-forks, of different pitch, tried in succession, will all rouse the same phenomenon, and the truth is, that small as they are, each one has set the entire material of the pianoforte or the table in vibration, and that, too, in accordance with its own rate of motion, so that the whole table or the whole piano has become, for the moment, a part of the tuning-fork, and is emitting sound in unison with it.

If we now vary the experiment, and hold our different tuning-forks near the open end of an organ-pipe or a flute, we shall not get the same uniform result. Those forks which emit the sound the pipe or flute would emit if blown into, or one of its harmonics, will be found to set the air in the tube into sonorous agitation, and the note they emit will be greatly reinforced; but the other tuning-forks, whose note is not related to that of the pipe in question, will be found to have only a trifling influence, if any, over the air in the tube, and this sound will not be perceptibly reinforced.

Thus we arrive at a fact of the greatest importance, namely, that some vibratory bodies will move in unison with almost any sound, while others, voiced to emit a particular note, will reinforce that note, or those related to it, but will be useless, or almost useless, as regards other notes.

It now becomes desirable, having considered some points relating to the nature of sound and its transmission, to ask. What means have we of influencing sound in a building? and what obstacles is it likely to encounter there, compared with what it would meet with in the open air?

There are two familiar instruments in everyday use, and a third some forms of which are also well known, which supply a sufficient answer almost without words to the first question, namely, "What means have we of influencing sound in a building?"

The two instruments I first alluded to are the violin and the speaking-trumpet. The third is any common reflector, say the sounding-board of a pulpit.

If we take any familiar sounding object, such as, for instance, a watch, and note how far its beat can be heard in a room, and then place it successively in the mouthpiece of a speaking-trumpet, in the focus of a parabolic reflector, or against the body of a violin, we shall find that in each case we have influenced the sound; and so far as I know, we have no possible means of influencing the sounds emitted in buildings, except such as bear an analogy to one of these three.

There will be something to be said by-and-by about impediments, and the avoidance of them; for, after all, except in extraordinary cases, the whole secret of success in building, for sound, lies in simply doing as little harm as possible; but as far as assistance to sound goes, I repeat, we cannot get beyond the teaching of the mirror, the speaking-trumpet, or the violin.

To return to the watch, we shall find that both the reflector and the speaking-trumpet cause its tick to be heard much more loudly at the same distance, or to be audible to a much greater distance than when uninfluenced; but only in one direction. The person to whom the trumpet is pointed, or towards whom the mirror faces, gets more sound; but a person at the side gets less.

Were the sound of such a nature as to be capable of being closely examined, it would be found in both cases to be deteriorated in quality of tone; and I am inclined to think more so by the reflector than by the speaking-trumpet, and in each case, if articulate, or otherwise very sharp and defined, it will have lost a little of its distinctness.

If, now, we take the violin and place upon it the watch, we shall find that the sound will be audible to a greater distance than when the watch is by itself; but will not be (as in the other cases) confined to one direction only. It will not, probably, extend in any direction so far as the trumpet would throw it, but will be much more equably heard; while, and this is the great point, whatever change takes place in its character, is entirely for the better. None of its distinctness is lost, but its tone is improved; and should the violin be a very fine one, and something with musical sounds be substituted for a watch, the effect on the quality of the sound will be very marked. A string, for example, stretched to sound a certain note, and excited by a violin bow, will give out its proper note, indeed, but its voice will be poor, thin, and weak. Transfer the string to the instrument, draw the same bow across it in the same way, and the note of the string, re-inforced by the vibrations of the body of the instrument, will be something totally different, incomparably firm, and yet identical in pitch and sharpness.

We ought, then, in building for sound, to take

* Whose numbers do not precisely correspond with those given by some of the French writers.

a lesson from each of these instruments. What are their peculiarities? In the reflector and the speaking trumpet, the influence upon sound is almost wholly a matter of form. In the violin it is also, no doubt, a matter of form, but as much if not more a matter of materials combined with form.

We gather, then, that we may, as in the speaking trumpet, impress an initial direction on sound as emitted, and guide it forward, or that we may aid its progress by reflectors behind or above the speaker, but that if we want to support or improve it, we must have recourse to the resonance, or sympathetic vibrations of some sonorous body, capable of lending itself to all the varieties of sound produced near it.

The common sounding-board often fixed over pulpits, acts as a reflector, but usually (being made of thin wood), as a resonant reflector, a much less dangerous neighbour than a hard smooth surface of plaster or stone, which has the disadvantage, that it reflects a sharp and somewhat spoiled echo, that travels in the same direction, indeed, as the primary sound, but is a little behind it, and seems often to mar its distinctness.

It will be readily understood that a slanting reflector overhead, to beat downward and forward rays of sound that would otherwise escape towards the ceiling and be lost, is likely always to do good, and can in no case be so injurious as one behind the speaker; and it need scarcely, I think, be added that the only reflectors that *can* be of advantage are those that throw the sound forwards in the same direction as that in which the speaker is speaking. An echo reflected down from a high ceiling, or worst of all, back from an opposite wall, will always be disagreeable.

It may be more appropriate here than afterwards, to notice a curious application of the reflector to pulpits, which was some years ago rather extensively made use of, and is illustrated in the model before you.

It appears from a pamphlet published by Rivington in 1829, entitled "Description of a Parabolic Sounding Board erected in Attercliff Church, by the Rev. John Blackburn," that this church is a parallelogram, 95 feet by 72, and 56 feet high, with an elliptical recess 32 feet wide by 10 deep for chancel, and the pulpit placed in the centre of the centre aisle, in front of the chancel. There is no clerestory, but there are pillars supporting a gallery. In this church it was impossible for the preacher to make himself heard, and after shifting about the pulpit in various directions with no marked advantage, he determined to erect behind the pulpit a sounding-board like a hood—parabolic in section with his head in about the focus of the parabola. He relied upon the property of that curve to reflect as parallel a series of rays diverging at the focus, and he adds, that the result exceeded his most sanguine expectations.

The congregation were now able to hear the preacher, and the remote seats of the church became some of the best. The inventor of this expedient was Mr. Blackburn himself, and he brought it before the public in this pamphlet, which is admirably and scientifically written, and also laid it before the Royal Society and the Society of Arts. With the last-named Society he deposited a model, which has since passed into the possession of the London University College, and it is by the courtesy of the secretary of that college, and of Professor Potter, that this model, which is the one before you, is intrusted to me for this evening's paper.

To proceed, however. In the Society of Arts Transactions I find two letters from Mr. Farish, the Jacksonian Professor at Cambridge, who had had one of these reflectors put up in *his* church. He reports most favourably both upon Mr. Blackburn's reflector and his own, saying that the sound is improved in *every* part of the church, and especially that of the more distant parts; *but* he alludes casually to inconveniences that had been supposed to exist, and says they are of no consequence.

This seemed like a flaw in the case, and as the point appeared of great practical interest, I obtained, through the kindness of Mr. Holland, of Sheffield, full particulars of the subsequent history of the reflectors, and, not to trouble you with all the details, found the main facts relating to them to be these.

First, I find the reflector has been pulled down from Attercliff Church, partly because it was unsightly, partly because the present incumbent can do without it, and partly because the inconveniences attending it were felt very trying by most preachers; though the inventor either was not annoyed by them, or endured them cheerfully for the sake of the real benefit he derived from the reflector, but some of the casual occupants of the pulpit found them so trying that they used to prefer preaching from the reading-desk. The disadvantages were,—first, that the speaker heard every word uttered in every part of the church; and, secondly, what was worse, had every word he himself uttered dinned into his own ears; and, lastly, that to do any good with the reflector he was obliged to keep still, with his head in or near the focus of the parabola. One of the neighbouring clergy preaching in the Cambridge Church states that he was at once amazed and amused at the distinctness with which he heard the whisperings of the charity children in the remotest part of the west gallery; and the converse of this transmission was true, for a watch placed at the focus of the parabola could be heard to the very end of the church.

As regards the general application of these instruments, I find that the carpenter who made the original one himself made and fixed no fewer than twenty-nine of them, including two at Oxford, one at Cambridge, one at Trinity Church, Huddersfield; one at Duckenfield, near Manchester; and one at St. Sepulchre's Church, Smithfield;—perhaps members present can inform us of the fate of some of these. Also, I find that at Darnall, near Attercliff, the end of the church was built in a parabolic shape, and the pulpit fixed in the focus. The preacher in this church is satisfied with the effect, but occasional preachers, some of them, dislike it. Lastly, I got information of one other church at Sheffield, where the reflector was put up and made use of, and satisfied the clergyman and those persons who sat in the centre and at the ends of the church, but the people at the sides heard worse than before, and complained accordingly; so much so that it had to be removed.

From these facts, which I hope I have not unduly extended, we may gather that the parabolic reflector possesses such disadvantages that it would never be safe to build the end of a room of that shape, and that, in most instances, it will be inadmissible, even as a palliative, in bad cases; but that, on the other hand, it does enable persons remote from the speaker to hear well, and therefore, in a church or room that was long and not wide, it might be valuable, if the speaker is not nervous, and does not employ much action. I need not add that it can hardly fail to be always frightfully ugly.

We pass now to consider the speaking-trumpet, and the analogy it may bear to a room. The action of the speaking-trumpet was for long attempted to be explained by the theory that the sounds were reflected across and across from side to side of the tube, and somehow got ejected nearly or quite parallel in direction from its mouth. But this theory fails in many ways to account for the phenomena of the speaking-trumpet, and M. Hassenfratz, the great authority on that instrument, declares that all his experiments led him to the conclusion that the effects on sound produced by the speaking-trumpet are due to a different cause. The air contained in the interior of the instrument, he maintains, being enclosed by its walls, is compressed by the vibrations of the sonorous body in a more vigorous manner than would be the case if the walls had no resistance; consequently, each individual particle of this air contracts a greater amplitude of vibration, and is capable of transmitting that action to a greater distance before it becomes entirely lost, than it would in the open air.

Now all this applies, *mutatis mutandis*, to a public speaker in a room. If you set him up in a spot where a great height over his head swallows up the sound above him, and vast spaces open on either side of him and behind him, the power of his voice is wasted in communicating vibratory motion to these masses of air, as well as to that mass which lies in the direction where the auditors are.

If now, avoiding the extreme of cramping and confining the space too much, you set your speaker under a low roof, which rises as it goes away from him, and in a recess that widens as it joins the main building, you procure him the advantages of the speaking-trumpet, and throw his voice forward by preventing it from losing itself. And it must further be remarked that if you want your speaker to be able to address a very numerous audience indeed, you must effect it, not by enlarging the building very greatly in every dimension, but by extending it in the direction towards which speech is directed—namely, forwards—with only such additions of height and breadth as are necessary to prevent the structure from failing through disproportion.

Turning now to the violin, we find its peculiar effects are due to resonance. As to the methods of procuring resonance, we have seen that a body of air in a room will reciprocate certain sounds, and we find in certain buildings that the air will reciprocate any musical sounds emitted, but with the disadvantage that it continues to sound them for some time after the original musical notes have ceased. Canterbury Cathedral is the finest instance of this sort of resonance I have heard of. Westminster shows it also. Beautiful as is the blending of sounds and richness of tone due to this cause, it is of more advantage to church music than to reading or speaking, as you will readily notice at Westminster. In ordinary public buildings, therefore, a large mass of empty space is to be avoided, not only because the air in it absorbs part of the power of the voice, but because it may be resonant in an undesirable way. The employment of thin planks of wood for procuring resonance is not open to the same objection, and nearly all the most celebrated acoustic buildings known will have been found to be fitted up to a great extent with wooden lining.

A floor on columns, with a hollow space under it, and a ceiling with a hollow space above it, are both adjuncts to resonance. It is to be remarked, that the presence of auditors in a room deadens the sound so much that if a building be such as to afford, when full, the greatest possible assistance to music and to the human voice, it is more than likely to have a very decided reverberation when empty.

Let us now for a moment ask what *harm* we can do to sound; what impediments a building may present to its propagation; and how far, in a new building, we may avoid those impediments, or, in one where they already exist, may neutralize or remove them.

The principal cause that will have an unfavourable influence on sound in buildings are echo, reverberation, obstacles, and unshapeliness or bad proportions.

Echo is, where it exists, one of the most formidable blemishes possible in a room, for it asserts its unwelcome presence with every word that is spoken. The presence of a flat surface at a considerable distance from the speaker or musician, and facing him, is very much to be avoided, as apt to echo, and consequently in almost all good public rooms the end farthest from the platform is curved, or recessed, or otherwise broken up, or has a gallery thrown across it, the front of that gallery being carefully arranged, so that either it shall not echo or shall reflect the sound to where there is no auditory. In case of an existing echo, the best remedy no doubt is to break up the surface of the reflecting wall in some such way as this. Where expense or other difficulties prevent this remedy being applicable, to hang up draperies, which may mask and break up the offending surface, is good.

In over-lofty rooms an echo is often perceived from the ceiling downwards. Such a one exists very decidedly in the new reading-room at the British Museum.

Should the echo, however, be indistinct, or very much broken up, or should there, indeed, be a noise, but not amounting to a regular echo, the disturbance is called reverberation.

The excess of resonance in an empty room often causes reverberation, and may be generally cured by covering those surfaces which reflect sound with soft substances. The audience frequently do it, but if not, the gradual addition of carpets or matting, or hanging up drapery, will proportionally deaden the excess of sonority in the room till a proper pitch of distinctness is gained. In a church in the north, where the reverberation was unpleasant, even when there was a full congregation, the desired quiet was, I am told, quite gained by laying down matting over the aisles and other open spaces.

Open skylights are very apt to reverberate, so are deep and square window recesses, and both ought to be avoided where sound is of great importance.

Lastly, damp walls reverberate much more than dry ones, and in a new building it may often be as well to hang up a little drapery for a few months, which can be safely taken down, when all gets quite dry.*

NATIONAL PROVIDENT INSTITUTION BUILDING, LONDON.—The foundation-stone of a new building, at the corner of Gracechurch-street and Eastcheap, intended for this life-office, has been laid by the chairman, to whom the board presented the silver trowel used on the occasion.

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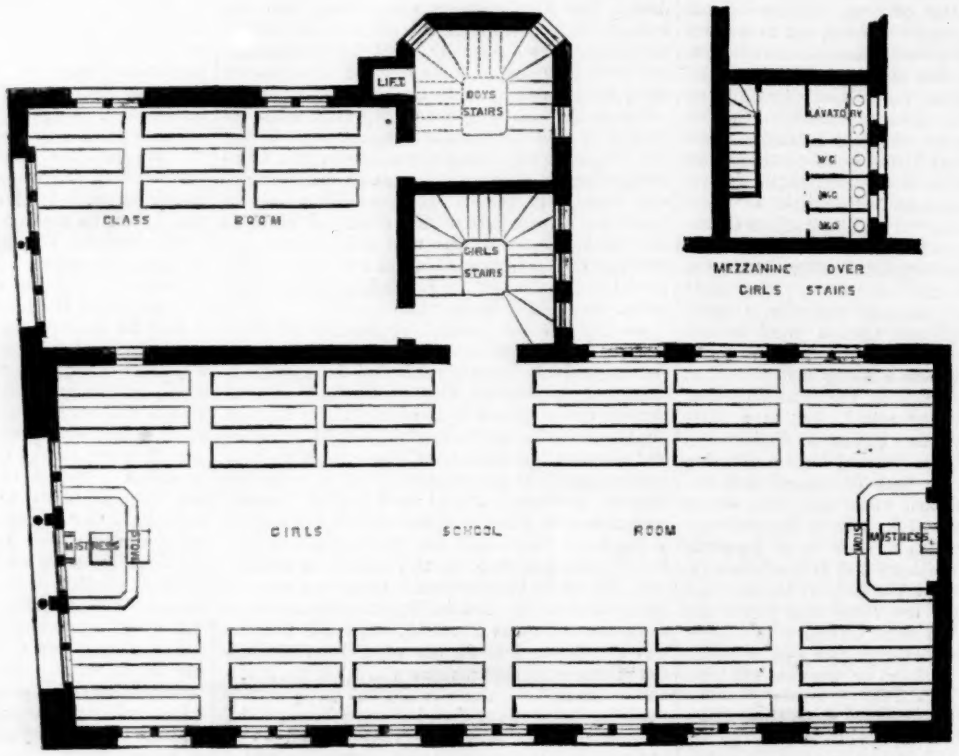
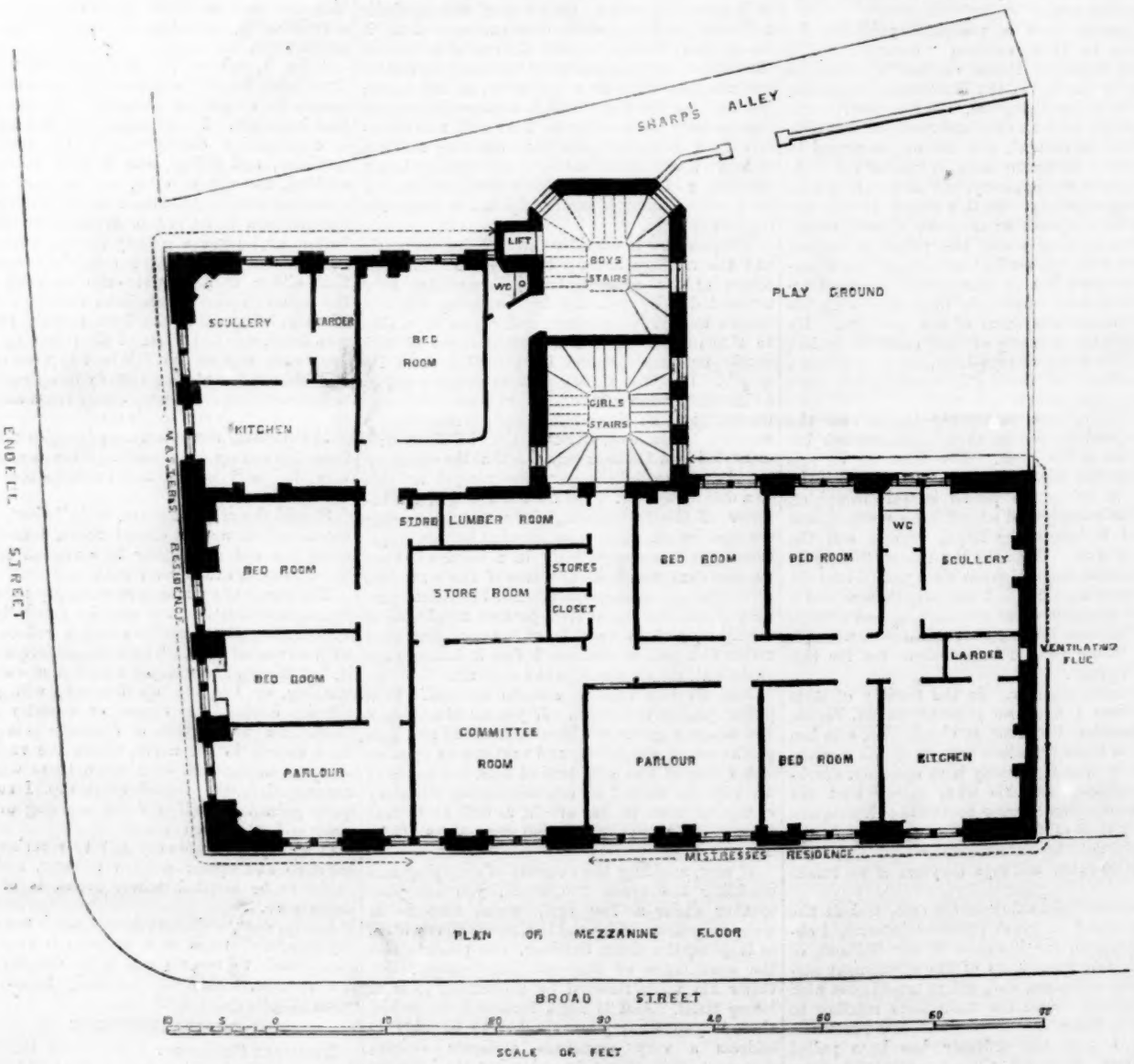
* To be continued.

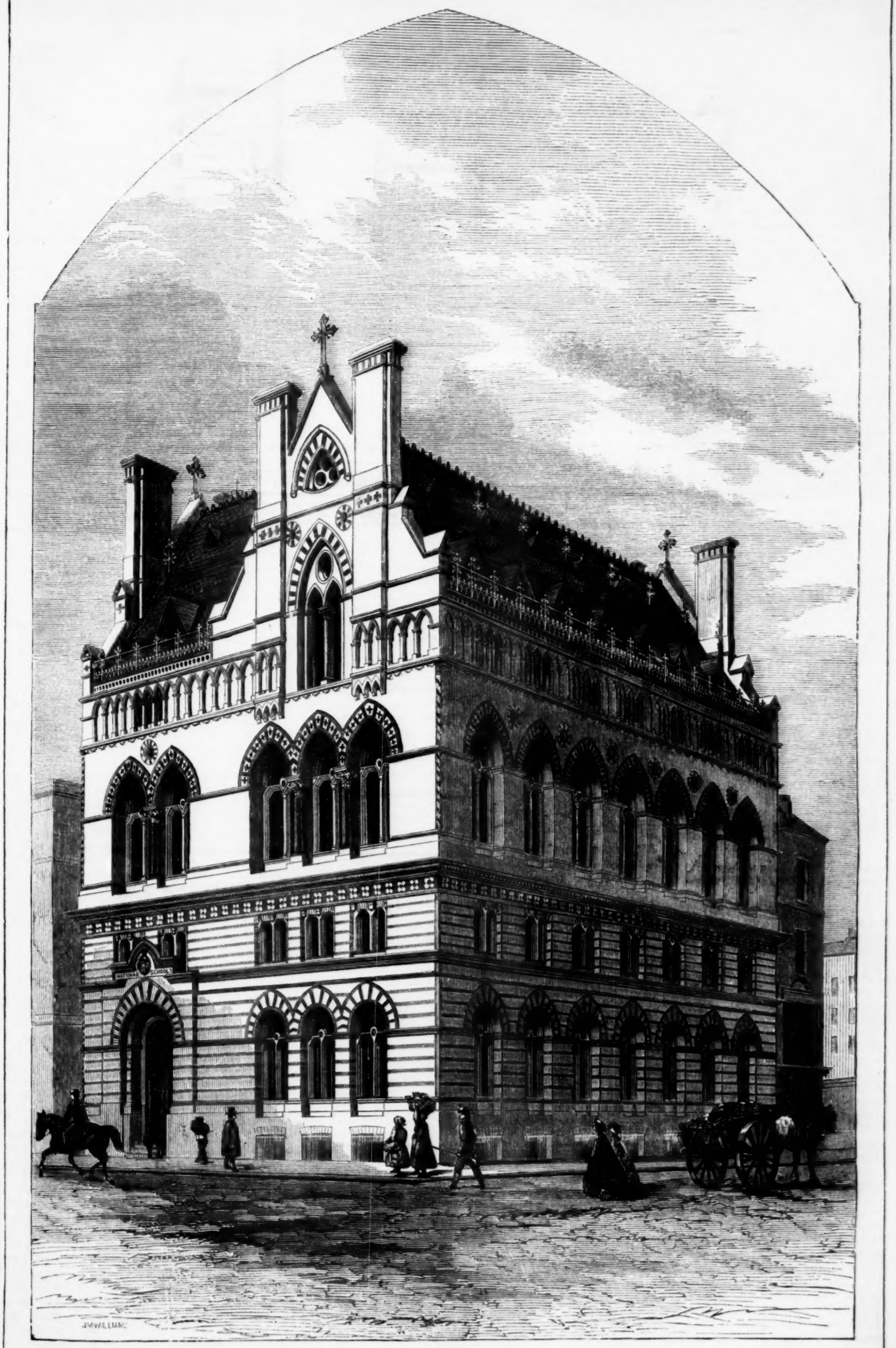


PLAN OF FIRST FLOOR GIRLS



PLAN OF MEZZANINE FLOOR

ST. GILES'S NATIONAL SCHOOLS.



ST. GILES'S NATIONAL SCHOOLS, BLOOMSBURY, LONDON.—MR. E. M. BARRY, ARCHITECT.

NATIONAL SCHOOLS, ST. GILES'S-IN-THE FIELDS.

SOME of our readers may have noticed a lofty brick structure in course of erection at the corner of Endell-street, where the latter enters Broad-street. The building is now completed, and on Wednesday last was formally opened, by the Hon. A. Kinnaird, M.P., in the absence of the Right Hon. Lord John Russell, as the National Schools of St. Giles's-in-the-Fields, having accommodation for nearly 1,500 children. Such an establishment, we need hardly remark, is greatly wanted where it is placed, as the neighbourhood is one of the worst in London. Great exertions have been made by the parishioners, headed by the present indefatigable vicar of St. Giles's, the Rev. A. W. Thorold, to supply the educational deficiencies of the parish; and the edifice just erected from the designs of Mr. Edward M. Barry is the first fruit of their anxious labours. We now give a view of the exterior, and plans of the principal and mezzanine floors. The building and its appurtenances occupy a site 75 feet long, with an average width of 60 feet; while a portion of the land, about 30 feet square, is set apart as a playground and a means of obtaining light and air, at the back of the building.

There are four floors, besides the mezzanines and attics over the staircases. The basement is proposed to be used for a soup kitchen, or for an industrial school. It is abundantly lighted by means of windows in the plinth of the elevations towards Broad-street and Endell-street. The ground floor is devoted to the infants' school, and contains a large schoolroom, 62 feet long and 23 feet wide, as well as a large class-room, and other conveniences. Immediately over the ground story is a mezzanine floor, 9 feet high in the clear; and here are placed residences for the schoolmaster and schoolmistress, and a committee-room, with store and lumber rooms. The master's residence is entered from the boys' staircase, and the mistress will have access to her house from the girls' department. The latter is in the principal floor, which is 18 feet high.

The girls' schoolroom is 72 feet long by 28 feet wide; and the class-room in connection with it is 30 feet long by 20 feet wide. It is intended to use the large room for lectures and other parochial purposes, in the hours when it will not be required for scholastic uses. The boys' department is over the girls' floor, and the arrangements are in all respects similar. Access is given to the boys' floor, by a separate staircase and entrance from Sharp's-alley. The girls and infants will enter by the principal door in Endell-street. A lift is constructed in connection with the boys' staircase, giving the means of hoisting from the basement to the highest part of the building. The lift finishes, externally, as a bell-turret, and is a conspicuous object from Endell-street. The materials used, externally, are brick, tiles, and slate; the last forming cills, weatherings, and copings. The prevailing colours are a warm yellow and red, but a few black bricks are also used. Black and red Minton's tiles form the string-courses between the mezzanine and principal stories. All the strings, and moulded work, of all kinds, are of red brick. The windows of the principal floor towards Endell-street are grouped together, and only divided from each other by columns of red polished granite, with boldly carved capitals.

The gutters are of cast iron, and so arranged that lead flashings are dispensed with. There is a railing of ornamental character fixed to the gutter to prevent snow, broken slates, &c., from slipping over into the streets, and to act as a parapet in giving protection to men who may be required to clear the gutter, or to repair the roof. The dormers, bell-turret, and hips of the roof, have ornamental finials of wrought iron, and cast-iron crosses are placed on the three gables. The roof is covered with green and blue slates, arranged in bands; and the ridge is formed of slate, perforated with trefoils.

The internal construction is very simple. The stairs are of Yorkshire stone, and the floors are supported by rivetted wrought-iron beams. All the floors are pugged, and a space is left between the floor and the ceiling joists below them, to prevent the transmission of sound. The roof, which has a space of 28 feet, is composed of principals formed by a semicircular arch, and collar over the same. The principals carry purlins and rafters in the usual way. All the internal woodwork is stained and varnished. The window-frames are so designed as to constitute important features in the elevations. Each arch-headed window has a transom across the springing of the arch, and a mullion connecting the cill with the transom. The windows in the part below the transom open internally as casements, and the part which fills the arch is hinged to the transom, to open inwards at any angle desired for ventilation. The rain-water pipes are of cast iron, and appear externally at the corners of the building. They are placed in the position so often occupied by a shaft in Venetian buildings; and their upper portions are ornamented by a twisted band cast on to the pipe. Means are adopted for admitting the external air to the school-rooms and class-rooms through the dado, and vitiated air-flues are built in the walls, and carried up into the chimney shafts, which are of great height, and are placed on the gable walls of the building.

The workmanship displayed about the whole of the building is very good, and reflects credit upon Messrs. Mansfield & Son, the contractors, and Mr. Dale, the clerk of works, to whom we must give credit also for an ingenious arrangement of the desks and forms.*

We congratulate the rector, Mr. Thorold, on having set up such a powerful means for good in his neighbourhood as these schools present; and Mr. Edward Barry on having produced one of the most successful brick-buildings of which our own time can boast.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

THE ordinary general meeting of members was held on Monday evening at the House in Conduit-street.

The chair was occupied by Mr. F. W. Porter.

The minutes of the last meeting having been read and confirmed,

Mr. T. Hayter Lewis (hon. secretary) read a list of donations to the library, including a copy of the illuminated volume by Mr. Owen Jones and Mr. H. Warren (published by Day & Son), entitled "Paradise and the Peri."

The Chairman, having announced that the next ordinary meeting of the Institute would be held on Monday, the 7th of January, when a paper would be read by Mr. G. E. Street, stated that, on an early evening, a discussion would be taken (at the instance of Mr. Tite, M.P.) on the various processes for the preservation of stone.

Mr. Penrose (hon. secretary for foreign correspondence) said it was with deep regret that he had to announce the death of two distinguished members of the Institute. The first was one of the most eloquent writers on art, the venerable and lamented Earl of Aberdeen. The deceased nobleman travelled in Greece long before the termination of the great war, and, in the year 1822, published a work which produced a great effect at the time, entitled, "An Inquiry into the Principles of Beauty in Grecian Architecture." His lordship was a member of the Dilettanti Society, and during his long life had done everything in his power to encourage classic art. The other member whose death they had to deplore was Mr. Samuel Ware, the author of a well-known treatise on arches and their abutments, published in the year 1809.

Mr. Kerr said he wished to call the attention of the members to something more than a formal recognition of the merits of the late Earl of Aberdeen. He would do so in no disparagement of the statement of Mr. Penrose, but, from a profound admiration of the high merits of the deceased nobleman. He (Mr. Kerr) had been brought up in the office of which the Earl of Aberdeen was the most distinguished client; and he was of opinion that his lordship had occupied the first place in the list of their vice-presidents. When the noble earl first came before the public in connection with art, the Gothic school (modern) was in its infancy, and that Baronial style of architecture, so to speak, was coming into vogue which had led the way to the Mediæval revivals of the present day. The Classical style of architecture had not then arrived at maturity; and, at that time, when such men as Professor Cockerell came before the public with Greek remains, Lord Aberdeen also presented himself, with perhaps more profound learning and acute judgment; because, from his position, he was enabled to devote more time and attention to the abstract principles of Greek style than any professional architect could be supposed to do. Since that time the Gothic school had arrived at a high position; and, although the architectural body were divided upon the subject and split into two camps, one advocating (as he himself did) the Classic, and the other the Gothic; still he thought they might combine, on an occasion like the present, and express their opinion on the loss of a high-minded and cultivated nobleman, whose writings on art were as eloquent as his knowledge was profound, and his taste pure and elevated.

Mr. C. H. Smith observed that, on the return of the noble earl from Greece, fifty years ago, Argyll House was subjected to very extensive repair and alterations. Although the building looked mean, and the elevation, perhaps, paltry, it contained some of the finest rooms of any private mansion in London, especially upon the ground-floor, some of which were 20 feet in height. The mansion was, he believed, built by Gibbs, and was decorated in the Roman and Italian style. The cornices of the rooms were very beautiful, and the ceilings were rich with elaborate ornaments, in the style of Sir Christopher Wren. When the Earl of Aberdeen bought the house from the Duke of Argyll, he had just concluded a lengthened tour in Greece, whither he had been accompanied by Mr. Wilkins, the architect; and he returned home imbued with a taste for Grecian art. The beautiful rooms to which he referred were forthwith stripped of the bold decorations in the style of Wren and Gibbs; and, in their stead, trifling and insignificant-looking cornices were put up, abounding in honeysuckles, after the manner of pure Greek art; and the elaborate ceilings gave place to a style of ornamentation plainer even than that of the room in which they were then assembled. This innovation was made, as he understood, in deference to the desire of the Earl of Aberdeen, who could bear nothing that was not Grecian.

The Chairman said he quite agreed in the tribute which Mr. Kerr had paid to the memory of the late earl, who was one of their most distinguished members. With regard to the observations of Mr. Smith, in reference to the internal decorations of Argyll House, the question was one of taste, upon which, of course, there would be diversity of opinion. He had now to announce that the council had fixed the 14th of January for a special general meeting of members, to consider the question of architectural examinations.

Mr. T. Roger Smith then read a paper on "Acoustics;" a part of which will be found on another page.

At the conclusion,

Mr. Scott Russell, in responding to an invitation, said he had very little to add to the almost encyclopædic paper which they had just heard, and which he felt had very nearly exhausted the subject. He would be chargeable with ingratitude, however, if he did not express his individual thanks to Mr. Roger Smith for the information contained in his essay. Mr. R. Smith had admitted with modesty that he laid no claim to be the discoverer of any new laws of nature, but he had done what perhaps was more valuable; for, instead of discovering one law of nature, and endeavouring to account for everything by that principle (which quacks often assumed to do), he had thrown a philosophical light over the entire subject. Although he could add nothing new to what Mr. Smith had said, he would venture to refer to a few instances which had come under his own observation, in illustration of the practical hints which he had thrown out. Certainly a great difficulty was to convert an ordinary room into a good sounding room. There was a radical difficulty between the necessities of a big room and those of a little one. A little room was infested with abominations which arose out of its littleness, and no doctor or quack could get rid of them. The public generally insisted upon getting a parallelogram, large flat surfaces and a flat ceiling, and there was really no cure for such a building. Under these circumstances all that could be done was to choose a tolerably good proportion, and make the room near to it, but not exactly it. He differed from Mr. Smith in thinking that we had not yet got the exact proportions for acoustic purposes, for he thought that if they took the ordinary harmonic numbers,—2, 3, 4, and 5 (all of which were good acoustic numbers),—and took them in breadth and height, they would procure a room which would speak easily, and resound to the human voice. If on the other hand they were only to come near to these numbers, the result would be a room which would neither speak nor sound. He believed that when they had the choice, if they kept the roof high, they would simply avoid echo; but that, if they wanted an audience to hear the speaker or singer, they must keep the ceiling low. If the

* The form and desk are in one; and, when required, the top of the desk turns over and serves as a back to the seat; or, the back edges of two desks being placed together, they form a table and seats.

room were low, and the speaker placed himself high, his voice would soon cease to strike the room at a reflecting angle. He had first noticed this in rather a remarkable manner. In Scotland, as they all know, half the church went out from the other half, and had no place to go to. The general assembly met in a building in which no one could hear what anybody else said. They then went to a low building where the ceiling was 15 feet high, and the floor about an area of an acre, where the audience (consisting of half the ministers in Scotland and their congregations) heard each other very distinctly, because the sound sensibly travelled along the low roof. The difficulties of echo would beset all large parallelograms. In theatres an attempt was made to get rid of them by breaking up the space with boxes and partitions; but he believed that the best form of building for 1,500 or 2,000 persons would be one pretty nearly a circular or an octagon, or a circle with four parallelograms. One of the best churches for hearing which he knew of in this style was that of St. Stephen, at Edinburgh, which was an enormous octagon, and in which from 2,000 to 3,000 persons could hear very distinctly a clergyman who had not a loud voice. In this church there were no echoes. The best form that he knew of for hearing and seeing was a circle, with the seats rising one above another, and covering as much of the bare wall as possible. The worst form was that nearest it, namely, a semicircle, with a great flat wall to echo the voice. The courts of justice, for instance, were built in this manner; and he could point to at least half a dozen of them in which nobody could see or hear anybody he wanted to see or hear. There was another point to which he would refer in reference to this subject. It should be borne in mind that there was one set of noises which it was desirable to hear, and another which it was undesirable to hear; and the great desideratum was to make a building in which what it was desirable to hear would be audible, and that which it was undesirable to hear would be inaudible. No one, for instance, wanted to hear, either in a church, a concert-room, or a theatre, fidgetting, rubbing of feet, or tittering. These were noises which no one particularly wished to hear; and theatres were generally so well constructed for hearing what passed on the stage alone, that the audience were very seldom disturbed by the not unfrequent loud conversation of persons in the boxes. Her Majesty's Theatre was the most wonderful building for hearing and seeing in; and he did not think he could suggest anything better, although it had faults which might be corrected very easily. He did not think the difficulties to be overcome were so great with a large building; for, where the building was very large, there was no bother on the score of resonance; and, if the building were raised behind, and the wall covered with heads to swallow the sound, the probability was that it would answer very well. The great secret of success in making a large building hear was to cover it with heads; for in a large building the voice required to be assisted. In a small building, on the contrary, the difficulty was to suppress the echo. He could personally speak to the accuracy of Mr. Smith's statements with regard to the parabolic reflector, for he had tried it when he was a guest at the house of Mr. Blackburn, and was frightened at his house. It was also, as represented by Mr. Smith, "villainously ugly;" and, moreover, prevented the congregation at either side of the preacher from hearing him. He therefore hoped that it would never be generally adopted in our churches. He also agreed with Mr. Smith in thinking that resonant roofs were great aids to hearing; that the roofs of churches should be of wood; that the top of the pulpit should be of the same material, and as large as possible; as, if this precaution were not taken, it would be impossible to prevent the speaker's voice from being lost. He did not believe in the parabolic form, but he believed that if the end of a building were narrowed near the speaker, the roof inclined, and the walls covered as evenly as possible, every auditor would get his share of the sound; and that, by attending to these principles of construction, all would be done that human nature could do to assist the voice. He begged to propose a vote of thanks to Mr. Smith for his excellent and instructive paper.

Mr. White, in seconding the vote, said he had devoted a good deal of time to the consideration of this particular subject; and that there were one or two points in the paper to which he wished to refer as briefly as possible. One of these was the proportioning of a room to given ratios. To determine exactly what these should be, would perhaps require a paper as long and elaborate as that which had been read that evening on the general principles of acoustics. Mr. Smith had, he thought, suggested those which were favourable to the transmission of sound, and in this respect he (Mr. White) believed that old churches were built with greater regard to the ratio than was generally supposed. On a late occasion Dr. Barlow, in lecturing on symbolism, had referred to a paper by him (Mr. White) on the geometrical proportions of Mediæval churches, but he begged to say that his paper had nothing whatever to do with symbolism as such. From the observations which he had been able to make, he had arrived at the conclusion that buildings which were the most beautiful in proportion were the best also for sound. Again, with regard to the general form of buildings, low aisles and lofty naves were best for sound. In reference to flat surfaces behind a speaker, as referred to by Mr. Scott Russell, in our courts of justice, he might state that on one occasion he remembered the Bishop of Lincoln preaching in the open air; when, instead of turning his back to the wall, he faced about towards it, and the result was that he was heard distinctly by several hundred persons. At Dorchester church, in Oxfordshire, the building was lofty, but with low aisles; and there, although the area was very spacious, every word uttered in the pulpit could be distinctly heard from one end of the church to the other.

Mr. Frazer, referring to the use of sounding-boards, mentioned the case of the great church of Amsterdam, formerly a Roman Catholic but now a Protestant building, in which the sounding-board was from four to six times the size of the pulpit. With regard to what had fallen from Mr. Roger Smith, it seemed to him that his paper contained perhaps too much theory without those deductions which would enable the architect to arrive at the proportions which would give certain effects. Mr. Smith had pointed out the descriptions of buildings which were unfavourable to the transmission of sound, but he had not given the actual proportions of a perfect building. Professor Donaldson, of Edinburgh, whose lectures on the theory of sound showed the attention which he had devoted to the subject, was at present building a music-hall in connection with the University, and the proportions which he had adopted were 30 feet wide, 45 in height, and 90 in length. He had tried various experiments, and the above proportions were the best he could devise. The building was now all but complete, and he (Mr. Frazer), understood that Professor Donaldson had been completely successful in making what might be termed a model music-hall.

Mr. Scott Russell said that Mr. Frazer was not quite correct in the enumeration of the proportions chosen by Professor Donaldson. The music-room in question was 96 feet long, 48 feet high, and 32 feet wide, and these were the three proportionate numbers of musical harmony which would make a good room.

Mr. C. H. Smith said that, if all the conditions of a room were equal, the sound would be heard more distinctly in winter than in summer, the density of the atmosphere making the difference. Some substances, it was known, absorbed sound, while others reflected it. Mr. Scott Russell had suggested that a wall should be covered with human heads, but he (Mr. Smith) took leave to suggest that they should be bald heads, because anything in the nature of hair or wool was antagonistic to the transmission of sound. This was proved at once by reference to a carpet warehouse, in which it was extremely difficult to hear. Experiments with regard to acoustics should always be made when the room was full. At the room of the Royal Society, the difficulty of hearing was so great that they were obliged to hang woollens across it to absorb the sound. The admission of the outer air, in cold draughts, had also a good deal to do with sound; for, in the orchestra of a theatre, it was known that if the door were suddenly opened so that the cold air rushed in, the musical instruments were all put out of order for the moment.

Mr. Morris said, one of the most important subjects in architecture was church building; and the exact position of the pulpit was an essential consideration. It was, in his opinion, essential that the pulpit should be placed very near a wall. It would be found, for instance, that the communion service was always better heard than any other part of the service, in consequence of the reflector formed by the recess in which the table stood, and which produced that abatement in the ceiling, and narrowing of the walls, necessary for perfect hearing. When, many years ago, he built a church, he went with the minister and made various experiments with the view of determining the site for the pulpit, and they found that the greatest effect was produced by placing it as near the wall as possible. At Westminster Abbey the sermons for the people were preached under the lofty cross, and the consequence was that those only heard who had the good fortune to get very close to the preacher; while those behind him could scarcely hear a word. On the previous day he attended Divine service in a church where the pulpit and the reading-desk were on the old plan. The result was, that the reader, who stood with his back to the pulpit, was distinctly heard; for the pulpit served as a sounding-board; but, when the minister came to preach, his voice was completely lost.

Mr. Penrose said the Institute would be anxious to have Mr. Smith's paper printed as soon as possible, in order to make experiments, for it was well worthy of illustration; and when the profession were in possession of it, it might assist them to remove an accusation often brought against them, namely, that they did not understand the principles of acoustics. On this subject an anecdote was told of the late Mr. Justice Maule, who, on being shown by a friend the plan of a room which he intended to build, and which he believed would be very good for sound, said, "Then you won't tell your architect!" He (Mr. Penrose) could corroborate the testimony of Mr. Smith in reference to the superiority of a wood ceiling, even in a room but 30 feet long. At St. Paul's Cathedral it became necessary, in consequence of the echo from the dome, to place something to prevent the sound going up, and with that view he had prepared a sounding-board, hyperparabolic in its sections, which he found had the effect of stopping the echo and propelling the sound. A preacher, speaking distinctly and slowly, might now be heard at a distance of 120 feet. There was a building at Athens which might be mentioned as having been constructed especially with a view to hearing, as the walls were made to radiate from an angle close to which the speaker stood. There was one building which he could mention of the parallelogram shape, which had been found favourable to sound, and that was the new church of St. Pancras, in which 3,000 persons could hear with distinctness. It was understood that semicircular roofs were very bad for sound, generally speaking, but this was not the case when the roof was very lofty, as in the case of St. Paul's Cathedral. There was one objection to a low building, and that was, that the ventilation would be imperfect, and there could be no doubt that the quality of the air had a good deal to do with the transmission of sound.

Mr. Hansard inquired whether any new effects had been produced at St. Paul's by the removal of the screen?

Mr. Penrose replied, that the music and preaching were now heard much better, and that the congregation in the transept were able to hear the sermon, which they could not do before.

The vote of thanks was then passed unanimously.

Mr. Arthur Shean Newman, of Tooley-street, was, on ballot, elected a fellow of the Institute.

Mr. Banister Fletcher, of 6, Oregon-terrace, Peckham-rye, was also elected an associate.

PROPOSED ARCHITECTURAL ALLIANCE.

Growing out of a suggestion which appeared in our columns, and a pertinent paper "On the Evils of our Present Practice, and the best Way to Remedy them," read by Mr. J. P. Pritchett, before the Northern Architectural Association, the latter body addressed a letter by their secretary, Mr. Oliver, as our readers know, to various architectural societies. The letter said:—

"The object of the Northern Architectural Association, as set forth in this resolution, is to establish an alliance or general association between the several architectural bodies in the kingdom, so that when any question arises affecting the interests of the profession, such as a proposed legislative enactment, any important competition, or any growing evil, the views of the profession at large may, by such an organization, be at once ascertained, and immediate action taken thereon.

Should the proposal be favourably received by the existing associations, the details of the plan will, of course, require the consideration of the various associations joining in the alliance; but I may just mention that in promulgating this idea the Northern Architectural Association do not wish to inaugurate an additional society, entailing expense and labour on its members. They merely wish to establish a bond of union amongst the several societies now existing, but which, under the present circumstances, are totally isolated from each other; and they think by the interchange of reports of proceedings, by correspondence on passing events, and by meetings of delegates on any *important* matters, much service may be done to the profession, as good feeling will thereby be promoted between distant members of the profession, and united action can be at once taken concerning any matters affecting their joint interests."

We are informed that replies favourable to

the proposal have been received from the council of the Royal Institute of British Architects; the Institute of Scotland; the Liverpool Architectural Society; the Birmingham Architectural Society; and the Glasgow Architectural Society.

A scheme of action has now to be prepared and discussed by the various bodies.

THE ARCHITECTURAL PHOTOGRAPHIC ASSOCIATION.

THE annual meeting of members was held, as mentioned last week, on Wednesday, the 12th, at 9, Conduit-street. Mr. I'Anson presided.

Mr. Moody, the curator, read the report of the committee, which included the following:—

"A sub-committee having carefully examined and valued the whole of the stock of photographs, amounting to about 1,300, and having selected more than 500 to be retained, in conformity with Clause No. 2 of the Objects of the Association, the committee are prepared to dispose of the remainder at a very moderate rate to subscribers for the current year, Schools of Art, and similar educational societies. The photographs will be open to inspection on application to the curator, Mr. Moody, at 9, Conduit-street, W. The uncertainty so publicly expressed last year as to the continuance of the Association, the partial derangement of its operations, the late period at which it opened, and the short duration of the exhibition, held in a new locality, naturally operated prejudicially, as is made manifest by the great diminution of the number of subscribers from that of the year 1859. But the committee confidently hope, from the numerous expressions of satisfaction which have been received, that subscribers will be induced, by the excellent quality and the extremely small cost of the photographs issued, to assist, by drawing the attention of their friends to the advantages offered by the Association;—as the larger the number of subscribers, the smaller the proportion of expenses to receipts, and consequently the greater advantages to each individual subscriber."

"The forthcoming exhibition, which will open on the 15th of January, will, it is anticipated, be an unusually interesting one—many artists having taken subjects expressly for it; and it has been sought, by inviting suggestions for the works which shall form the subject of photographs, and by directing the attention of photographers to these subjects, to advance as much as possible the practical character of the subjects exhibited."

"To Mr. F. C. Penrose the best thanks of the committee are due, he having sent, in his capacity as Honorary Foreign Secretary to the Royal Institute of British Architects, a circular letter to the foreign and corresponding members of that Institute, requesting them to make known the objects and advantages of the Association to photographers resident in their respective towns—a measure from which the committee anticipate the most favourable results.

The following gentlemen have kindly undertaken the office of Local Honorary Secretaries:—Mr. Mawson, of Bradford; Mr. Suter, Brighton; Mr. R. M. Phipson, Norwich; Mr. M'Gibbon, Edinburgh; Mr. W. H. Reid, Plymouth. The committee will be glad to receive the names of gentlemen in other towns willing to act in the same capacity. They have the pleasure to announce that Mr. Beresford Hope has consented to act as the third trustee.

The following gentlemen are the retiring members of the Committee:—Messrs. Aitchison, Clifton, Garling, Morgan, and Whichcord, of whom Mr. Morgan offers himself for re-election.

The following have expressed their willingness to serve on the Committee. We have the pleasure of proposing them, to make up the full number of twenty-five:—Messrs. A. J. Baker, George Truefitt, J. P. Seddon, Roger Smith, and W. S. Barber."

The general account of receipts and expenditure from the 30th of November, 1859, to the 30th of November, 1860, showed that the Association had received 1,015*l.*, as follows:—Balance from previous year, 112*l.*; subscriptions received in 1860, 508*l.*; ditto for future years, 4*l.* 4*s.*; ditto for photographs in excess of subscriptions, 339*l.*; admissions, 33*l.*; season tickets, 3*l.*; sale of catalogue, 7*l.*; illustrated ditto, 6*l.* The expenditure included the following items:—Liability from former years, 89*l.*; dilapidations at Suffolk-street, &c., 23*l.*; rent of Conduit-street Gallery, and expenses of exhibition, 80*l.*; advertisements, 72*l.*; paid to photographers, 440*l.*; curator's salary, 30*l.*; balance in the hands of curator and in the bank, 217*l.*—total, 1015*l.* The statement of assets and liabilities showed an estimated balance in favour of the Association of 181*l.* 19*s.*

The Chairman, in moving that the report and statement of accounts be received and adopted, said that the committee wished to be empowered by a general meeting to dispose of their surplus stock. It had been examined by the Committee with great care, and an estimate of its value had been carefully made. From this examination the committee were enabled to state that the value was fully equal to that of last year.

Mr. C. C. Nelson seconded the motion.

Mr. Baker commented upon the expenditure, which he stated was larger than the receipts. He hoped, however, that the Association would be enabled, by the sale of their photographs in stock, to balance the account; and that in future years either a larger income would be obtained, or some means devised of economising the expenditure.

Mr. Lightly said that the expenditure last year was to some extent exceptional, as there was a heavy charge for advertisements, &c., consequent upon what might be termed the reconstruction or revival of the Association. Moreover, the number of subscribers estimated was 1,200, whereas 500 were all that were obtained. He had no doubt, however, that from the satisfaction so generally expressed by the subscribers, they would interest their friends, so that a large measure of success would attend the operations of the Association during the coming year.

The motion was then put and agreed to.

On the motion of Mr. Lightly, a resolution was passed empowering the Association to dispose of the surplus stock of photographs.

Mr. George Truefitt was elected an auditor in the room of Mr. Webb, deceased.

Mr. W. Beresford Hope was elected one of the trustees.

The retiring members of the committee having been re-elected, thanks were voted to them, to the trustees, auditors, and honorary secretary (Mr. Lightly), for their services.

The Chairman, in acknowledging the usual compliment passed to himself for presiding at the meeting, expressed his hope that the next exhibition would be successful, and that the Association would continue to give satisfaction to the subscribers. He admitted that the expenditure was large compared to the receipts, but he hoped this anomalous state of things would not exist another year.

ART AND ITS CRITICS.

LIVERPOOL ARCHITECTURAL SOCIETY.

THE sixth meeting of the session was held on Wednesday evening, the 12th; Mr. James Hay, the president, in the chair.

Mr. W. H. Picton, the hon. secretary, having announced various donations,

The Chairman presented Mr. Doyle with "Fergusson's Hand-book of Architecture," as a prize for the best set of drawings made during the summer.

Mr. Frank Howard then proceeded to read the paper for the evening, which was entitled, "A History of Art, and its Critics."

After some prefatory observations, he said the first specimens of painting on sculpture which we found consisted of rows of these single, simple figures, either standing, sitting, or walking in procession. From this rude mode the art proceeded to the formation of groups, and hence originated one of the first principles. When a number of figures were introduced into one subject, it was found necessary to distinguish the principal figure in the piece. This was done by making the god, the hero, or the king, much larger than the subordinate figures; and this practice was adopted at the Parthenon, in Athens. In the subsequent progress of art, the principal figure was distinguished by being more elaborately finished than the subordinate characters. The next desire was to distinguish figures by character. Polydorus wrote the names of the deities he meant to represent under the figures, and the same practice appears to have been adopted in some of the Etruscan vases. Phidias had the credit of individualising character, for he fixed the forms of the gods, from which, it was said, no Greek ever after departed. With the name of Homer we were introduced to the earliest criticism of art. (Mr. Howard here read *in extenso* the passage in which Homer describes the figures on the shield made by Vulcan for Achilles.) As a worker in metal, he might be allowed to testify that this description of Vulcan's work was so thoroughly practical that the author must have seen or practised the operations. The reader also quoted Hesiod's description of the shield of Hercules. In each criticism, he contended, there was exactly the same description: record, and nothing else was held up. The next step in the art was the perception of form. Pericles called in Phidias to decorate the Parthenon. These wonderful productions of Phidias and his pupils, the remains of which now went by the name of the Elgin marbles, had been acknowledged as unapproached, if not unapproachable. Phidias was ranked as the foremost sculptor of the world. It was left to Mr. Ruskin to make such a fool of himself as to say that he would rather see the Elgin marbles in fractions in the museum than have seen them in their perfection in the Parthenon. The next step was the imitation of objects, and here the dangers of art commenced. Zeuxis followed Phidias in idealizing form. When he painted the picture of Helen, he required seven beautiful virgins as models, and out of them he made his "Firebrand of Troy." Subject was lost sight of in the imitation of objects. Zeuxis painted a man carrying grapes; and, when it was hung out, the grapes were so natural that the birds came and pecked at them. A contemporary painted a curtain so perfectly that Zeuxis asked him to pull the curtain aside that he might see the picture; exclaiming, when he learnt the truth, "Zeuxis has deceived birds, but you have deceived Zeuxis." Zeuxis then sought to elevate art, and painted a subject piece of Centaurs. The public only admired the glossy skin of a lion's cub in the picture; and, in disgust at their taste, Zeuxis ordered it to be removed. "The public," added Mr. Howard, "only admire the clay of our art." Landseer attracted more by the fine gloss of his bay horses than by any other quality in his pictures. He was told of Andsell and Landseer that they had dogs and horses rubbed over with bear's grease to make them glossy when they painted from them. This was what painting for the public inevitably led to. Public opinion had never been so satisfactory as when it was convinced of its own ignorance, and was wise enough to know that it knew nothing. Mr. Howard then went on to the revival of art in Italy, tracing the progress down to the present day, and giving criticisms of the works of the great masters. The principles, he contended, upon which artists judged were always the same,—invention first, then taste, and last execution. The public reversed them, and put execution first and invention last. As to artists, it was only in the application of the principles that differences arose. The whole of art had not been settled. There were some questions of science yet to be solved. But should it be urged upon the strength of these unsettled questions that the uninstructed public were as qualified to judge as those who had made these matters the study and even the experiment of their lives? Because artists doubted, were the public to decide? If so, the severe censure of Pope would be justified, "that fools rush in where angels fear to tread."

A discussion ensued, some of the members maintaining that in the long run public opinion on art was, on the whole, sounder and more correct than that of artists,—a very defensible position, inasmuch as it says in other words that the ultimate deduction from the opinions of the many is more likely to be sound than the opinion of an individual.

SITES FOR PUBLIC STATUES.

NOTWITHSTANDING that we can with justice claim the honour of having had, amongst us, men most eminent in literature and science, it is remarkable that, with the exception of Jenner, we have no street monuments, in the metropolis, of those worthies who, in peaceful, scientific and literary pursuits, have shed lustre on this land.

In various directions,—in the streets and squares,—there are memorials of naval and military heroes, statesmen, and persons of rank; but we look in vain for such marks of esteem,—placed in the sight of the multitude,—in honour of those who have been national benefactors in science or literature, and who have thereby acquired a world-wide fame. Neither Shakspeare, nor Sir Isaac Newton, nor Milton, for example, has an open-air monument. This is a matter not creditable to the present state of our intelligence and advancement. In most foreign capitals, a better spirit than this is shown.

It has often occurred to us that many of the statues which have been placed in London seem not to be in the right situations. Generally, there has been a disposition shown, if we except Trafalgar-square, to place the street monuments in as isolated positions as could be contrived; and in few instances, in the metropolis, has monumental statuary been made accessory to our public buildings, as we have often urged; and notwithstanding that this might often be done with advantage. It is to be hoped that, in the arrangements of the new law courts, there may be ample opportunity afforded for placing in front of the buildings, in prominent situations, representations of worthy lawyers who have done honour to the bench. Connected with the exterior of the College of Surgeons, or Physicians, we would like to see effigies of Hervey and John Hunter. In front of the British Museum, why have we not the figures of some of our most famous philosophers and poets? What place so fit for memorials of Shakspeare and Milton as the bases or pedestals which seem to have been made for the express purpose on each side of the central portico? An avenue of statues, stretching from the metal gateway to the main entrance of the Museum, would have an excellent effect; and ample space might be found here for at least twenty memorials: and amongst these we might expect to find such men as Caxton, Sir Christopher Wren, Sir Joshua Reynolds,—who was both a painter and author,—Sir Isaac Newton, Oliver Goldsmith, Dr. Johnson, and others whose names will come to recollection.

When we reflect how powerless the efforts of the wisest general, or the bravest soldier, would be against those modern cannon and rifled muskets and other means which science has brought into use; and on the civilizing effect of literature; it would seem that the time has arrived when equal honour should be shown to peaceful benefactors of the state, with that which has been shown to the mighty men of the sword.

KING GEORGE III. AND ART.

HOWEVER great may have been the mental deficiencies of this monarch, and obstinate his disposition, it is but just to say that art, science, and literature were beholden to him for judicious encouragement and assistance: although himself of imperfect education, and no great reader, he was ready to admire the talent of others. With great judgment and much munificence, under the direction of this king, the famous library which forms such an important feature of the British Museum was gathered together. The collection of topographical prints, the maps and plans, are both curious and valuable, and show that they were purchased *con amore*. This seems to have been his majesty's favourite study; and, probably, several of the plans are the work of George III.'s

own hands, for good authority states that he copied every capital chart, took the models of celebrated fortifications, and the soundings of the chief harbours in Europe. In 1820, there was in the Queen's library, at Frogmore, a portfolio of drawings—about fifty in number—done by George III. when Prince of Wales: they are problems worked out from a work on practical geometry, with vignettes to each, drawn in Indian ink, on small folio paper. His majesty had an early predilection for the study of architecture; and this preparatory department was probably the groundwork of his knowledge of the art. It is probable that these drawings were made with Mr. Kirby, as that artist was the instructor of his majesty in the science of linear perspective. A celebrated antiquary and virtuoso, writing from Rome, on Dec. 16, 1762, says, "Nothing gives me more satisfaction than to find so many fine things purchased for the King of Great Britain. He is now master of the best collection of drawings in the world, having purchased two or three capital collections in this city, the last (belonging to Cardinal Albanis) for 14,000 crowns; one kind of which are original drawings, by the first masters; the others, collections of the most capital engravings; and lately there has been purchased for his majesty all the museum of Mr. Smith, at Venice, consisting of his library, prints, drawings, designs, &c."

The king was remarkable for his free and kindly bearing to men of genius. To Reynolds and West he showed particular favour, and his support of the Royal Academy from its commencement is well known. It is said that the king first suggested to Mr. West the professional study of Scripture history, and desired him to bring his drawings to the palace for inspection. Mr. West did so, and came at a time when the sovereign had with him some dignified clergymen. The company were all gratified with the sketches and with their accuracy to the Scripture text, affording proof of the painter's acquaintance with the Scriptures. "And do you know how that was?" said his majesty to the prelate who made the remark. "Not exactly, your majesty." "Why, my lord, I will tell you. Mr. West's parents are Quakers, and they teach their children to read the Bible very young. I wish that was more the case with you, my lord."

It was in conversation with Joseph Lancaster that the king expressed the worthy sentiment that "he hoped the day would come when every poor child in his kingdom would be taught to read his Bible."

George III.'s appreciation of Handel should not be overlooked, and, as an evidence of his generosity, it is worth while to state that, during his illness in 1789, a committee, appointed to examine the state of the privy purse, found that, out of an income of 60,000*l.* per annum, his majesty never gave less than 14,000*l.* a-year in charity.

However much all must regret the general events—the bloodshed and expenditure—of this reign, it should be remembered that both art and science emerged, as it were, in England, at this time; and that manufacture, commerce, and education all became extended in a most remarkable manner.

MISS COUTTS'S DRINKING FOUNTAIN.

The most important drinking-fountain yet designed for London is being erected through the munificence of Miss Burdett Coutts, in Victoria-park. It includes a colonnade around four fountains, covered with a dome, and will be constructed of Aubigny stone and green and red marble. There will be figures of Sicilian marble, and bronze appliances. The height will be 57 feet, and the diameter of the structure 26 feet, while the steps around the whole will extend to 40 feet. Mr. H. A. Darbishire is the architect; Mr. George Smith, of Pimlico, the contractor; and the cost will be about 5,000*l.* Miss Coutts does nothing by halves.

THE MYDDLETON STATUE AND FOUNTAIN FOR ISLINGTON.

The old police-station at the corner of Islington Green is at last cleared away, and the site will be prepared for a statue and fountain, which are being executed by Mr. John Thomas, the sculptor. The design consists of a statue of Sir Hugh Myddleton, proposed to be in Sicilian marble, 8 feet 6 inches high, in the picturesque costume of the period, raised on a rich pedestal, with sculptured dolphins and shell, supported on consol-shaped trusses, at the angles, which are intended for fountains. Marble panels are on each face of the pedestal, which is also enriched with festoons of shells and water-flowers. The pedestal stands in the centre of a basin for water, with an ornamental curb, 3 feet 6 inches high, of an Italian-shaped plan, 24 feet in diameter. On pedestals on each side of the curb to basin are sculptured boys with vases, from which will spring jets for drinking fountains, falling into marble shells, supported on corbels.

Sir Morton Peto, Bart., M.P., presents the marble statue: the other portion is to be erected by subscription.

THE ROYAL ACADEMY MEDALS.

On Monday, the 10th inst., being the ninety-second anniversary of the foundation of the Royal Academy of Arts, the following silver medals were awarded, at a general assembly of the academicians.

To Mr. Thomas Henry Watson for the best architectural drawings,—the Morning Chapel, St. Paul's Cathedral.

To Mr. James Turpin Hart for the best drawing from the antique.

To Mr. Charles J. T. Smith for the best model from the antique.

To Mr. Thomas Henry Watson for the best perspective drawing,—the Royal Exchange.

To Mr. Thomas Henry Watson for the best drawing illustrating sciography.

The President, Sir Charles Eastlake, justly complimented Mr. Watson on the zeal, industry, and talent displayed by him, and stated that the medal for the best architectural drawing was to be considered a first-class medal, conferring upon him the privilege of a student for life; and that in addition a book handsomely bound and inscribed would be sent him.

We add our congratulations to those of the president. Mr. Watson's father has been long known to many members of the profession.

THE FEMALE SCHOOL OF ART.

If we mention that an exhibition of paintings, drawings, sculpture, and other works of art, will be opened early in June, 1861, the proceeds of such exhibition, and sale of pictures, to be appropriated to the fund now raising for a building for the permanent establishment of "The Female School of Art;" and that the exhibition will terminate with a bazaar, for which contributions are solicited; we may, perhaps, lead some of our readers to interest themselves in the undertaking. The contributions will be thankfully received by the superintendent, Miss Louisa Gann, between this time and the 1st of May, 1861.

The school is at present carried on in a house in Queen-square, Bloomsbury (No. 43). These premises are in many respects better adapted for the school than those in Gower-street; but what is needed is, that the school should be rent free, and that its permanency should be established.

The students are doing their utmost: they have formed an evening working party, and an afternoon painting and sketching party, to make suitable articles for the bazaar,—a praiseworthy course, as their time is valuable to them for study, and they have already subscribed to the fund, besides now paying a raised fee for instruction.

CHURCH-BUILDING NEWS.

Luffenham.—The tender of Messrs. Cave, of Oakham, and Halliday, of Greetham, builders, has been accepted for the restoration of South Luffenham Church.

Saffron Walden.—The church here has been opened after extensive reparation. The entire works have been completed by Mr. Wm. Brown, of Lynn, builder, who has lately carried out similar restorations at Newport, High Roothing, and other churches in Essex.

Buckland.—The parish church of St. Mary, at Buckland, near Reigate, has been restored. The glazing of the east window is by Mr. Hardman: "The Crucifixion" occupies the centre light, the figure on the cross being thrown out from a ruby vesica. In the side lights are the figures of the Virgin Mary and St. John. The tracery in the upper part centres in a circular cusped light, in which is the Lamb, and exhibits angels in adoration. The two other windows in the sanctuary are—one, representing the visit of the holy women to the sepulchre; the other, the raising of Lazarus. The roof is of oak, in panels, the last row of which over the altar is decorated with tracery, painted and gilt, and bears, in the centres of each, shields with a cross of fleur-de-lis. Over the altar and on either side, are the emblems of the Evangelists; while, at the intersections of the ribs, are carved and gilt bosses and shields bearing the names and emblems of the apostles. The pavement is a green trellis with black spots at the intersections, the interstices of the trellis being filled with tiles, increasing in richness as they approach the altar. On the north side of the chancel is a four-centred arch, moulded and filled up to the capital with an open oak screen for an organ. The pulpit occupies the north-east corner of the nave, and is octagonal in shape. A large three-light window is filled in with the subject of the Nativity, with attendant angels in adoration. A newell staircase of open work leads up to the ringing-chamber in the tower, where there are five bells. The fittings throughout are of English oak. The works have been carried out under Mr. H. Woodyer, architect, by Mr. Wm. Shearburn, builder, Dorking.

Staunton (near Tewkesbury).—The church of St. James, Staunton, has been restored, on plans furnished by Mr. G. R. Clarke, of London, architect, at a cost of 720*l.* The chancel has been rebuilt, a vestry erected, a new roof placed on the north aisle, the old nave roof unceiled, a porch erected, and a finial and lightning-conductor added to the spire. The old chancel arch, also, has been replaced, open seats provided throughout (the old bench ends, which exhibit specimens of carved tracery, being preserved), and a new pulpit and reading-desk provided. Three new windows have been placed on the south and north sides of the church, and a stained-glass window at the west end of the nave. The subjects illustrated in the three compartments are the texts, "Rise, take up thy bed and walk" (John, v. 8), "When he looketh upon it he shall live" (Numbers, xxi. 8), and "Receive thy sight" (Luke, xviii. 42). The whole of the works have been completed by Mr. Griffiths, of Eldersfield, builder.

Dawley.—A new Wesleyan chapel has been opened here. The new edifice, built upon the site of the old one, occupies a conspicuous situation. Mr. Griffiths, of Bridgnorth, was the architect. Mr. Bray was the builder. The style is Italian. Fronting the street is a tower of white, blue, and red brick; the crown mouldings, strings, and cornices being of Bath stone. It is finished with deep corbel cornice, hipped roof, and weathervane, and has openings for a clock. The main roof is carried higher than the sides, in order to obtain light by means of nine clerestory windows, in consequence of buildings blocking up the back. The chief entrance is beneath the tower, up which a stone staircase also leads to the end and one of the side galleries. The centre is divided from the aisles by white brick pillars, and semicircular arches of the same material (blue and white), and finished with label moulding—the whole painted. The total cost will be about 1,200*l.*

Marden (Herefordshire).—The church here has been restored. The old plan has been adhered to, according to the *Hereford Times*, and everything valuable as mere material, or as archæologically or architecturally interesting, preserved and re-adapted in the new edifice, such as the pillars and arches, the well and niche of St. Ethelbert, &c., and the old type has likewise suggested the character of the new work. In taking down the old roofs and walls, it became a subject of wonderment how they could have held together. The timbers of the roof were found to be in many important parts perfectly pulverized with decay, the bond of the masonry everywhere imperfect, and the mortar worthless. In re-building, the nave pillars have been set at their original elevation. The nave is separated from the aisles by arcades of four bays on each side, and is surmounted by a simple clerestory, pierced with quatrefoil and trefoil apertures. The west façade of the church is composed of a three-light window in the centre, with cinque-foils at the ends of the aisles, and a sexfoil in the gable. The aisles are lighted with eight two-light windows of various designs. There is a stone porch on the south side, with a moulded archway, the inner doorway being a restoration of the old one. The framing of the roofs is visible internally. The benches have been restored. The aisles are laid with encaustic tiles, supplied by Mr. Godwin, of Lugwardine. The works have been carried out from the designs and under the superintendence of Mr. Thomas Nicholson, of Hereford, the diocesan architect, Mr. Crittenden acting as clerk of the works, and Mr. Noden, of Leominster, being the builder.

Canon Froome.—A new church has just been erected for this parish, the tower of the old one only being retained. Mr. Bodley was the architect, and the work is in the Early English style. The walls are of the local red stone, left free from plaster. Bath stone has been employed in the windows and pillars. The floor is laid throughout with tiles, the chancel floor being enriched with marble bands and four marble steps. The

chancel stalls, altar, and pulpit, are of oak, carved. The eastern wall is adorned with a reredos of alabaster, inlaid with marble, displaying the cross above the table, while a window (the work of Messrs. Clayton & Bell) represents in three compartments the Nativity, Crucifixion, and Resurrection of our Saviour. The nave and aisles are furnished with movable oak benches and chairs. Mr. T. Collins, of Tewkesbury, was the builder; and the reopening took place on the 6th instant.

Upton.—A new Independent chapel at Upton, near Chester, has been erected and opened for divine service. The design was furnished by Mr. Thomas Lockwood, of Bolton, architect, and has been carried out by Messrs. Lockwood and Farrimond, of Chester, builders.

Leicester.—The lofty stone spire of St. Martin's Church is a spire no longer, and the crazy old tower is now eased of its weight. The difficult task of taking it down was entrusted to Mr. William Neale, carpenter, Leicester, who has accomplished the work without mishap or accident, in little more than three weeks. The sort of crow's-nest scaffold thrown out of the four upper windows of the spire, and by which the most dangerous part of the work was to be performed, was a noticeable feature in the work of demolition. It is to be hoped, when the tower is taken down in the ensuing spring, the whole being to be rebuilt, on a design by Mr. R. Brandon, of London, architect, that funds will not be wanting to carry it out in its entirety, and once more to make the lofty spire of St. Martin's worthy the fine old church to which it is to be an appendage.——The foundation-stone of the new church of St. Andrew has been laid by the Duke of Rutland. Mr. Scott is the architect; Messrs. Osborn, of Leicester, are the builders; and Mr. J. Firn, the stonemason.

Derby.—The foundation-stone of a new Wesleyan chapel has been laid at the top of Canal-street, London-road, Derby. The new edifice will accommodate 900 persons. It is to be 80 feet long by 47 feet wide, and the total height on the walls 30 feet. Means are provided by four staircases for entrance to and exit from the galleries, which will be circular in form, a space being left for an organ and singers. A basement story below the chapel, in height 10 feet, will contain a room for school or public meetings, 60 feet long and 20 feet wide, besides four vestries, &c. The building is to be faced with bricks with stone dressings. Facing London-road there will be two octagonal turrets, surmounted with perforated stone pinnacles, relieved with tracery and canopies: they will be about 66 feet high. The front windows will also be relieved with tracery, labels, and carved terminations, and construction arches formed with blue and white bricks. The sides will have buttresses and plain lancet windows, with labels and arches the same as to the front windows. The design is by Messrs. Giles & Brookhouse, of this town, and was selected in competition. The tender of Mr. Wm. Bridgart has been accepted, and will now be carried out. It is estimated that the total cost on completion will be about 3,000*l.*

STAINED GLASS.

Albury Church.—A stained glass window has been placed in this church, painted by Lady Rokewode Gage, of Albury-park. The subject is St. Peter. The glass was provided by Messrs. Powell. Lady Gage intends, we understand, to paint the other windows of the chancel in turn.

Salisbury Cathedral.—A painted window has been placed in the chapter-house of this cathedral by Miss Wickens, of the Close, as a memorial to the late Mr. James Wickens and his relict, the parents of Miss Wickens.

Christ Church, Heaton Norris.—Another memorial window by Messrs. Edmundson & Son, of Manchester, has been put up in this church, making the fifth. The subjects, which are in three medallions, are,—"The Raising of Dorcus," "The Raising of the Widow's Son," and "The Raising of Jairus's Daughter," with diapered grounds and border.

Warrington Church.—Mr. R. B. Edmundson has erected in this church a window in memory of his own parents. It is the west window in the north aisle, consisting of four principal lights and tracery in the Decorated style, and is one of the new windows of the recent restoration by Messrs. J. & H. Francis, of London, architects. The principal subjects are Simon with the infant Jesus in his arms, in the Temple; Mary and Martha; Mary seated at the feet of Jesus hearing His teaching; the Resurrection, and the Ascension. Below are four angels, bearing scrolls inscribed with suitable texts. Each subject is surmounted with canopy work. In the large opening in the tracery is a representation of the Good Shepherd. The remainder is filled up with angels, emblems, &c., with the following inscription at the bottom of the window:—"This window was erected to the honour and glory of God in affectionate remembrance of James and Elizabeth Edmundson, by their son, R. B. Edmundson. Also in memory of Barbara Edmundson, his sister, and Ralph B. Edmundson, his son. A.D. 1860."

Manchester Cathedral.—An unknown individual has had completed, and erected, in the west end of the south aisle, a stained and painted window. This window is of four principal lights, with tracery. The subject represents Aaron and Hur staying up the hands of Moses during the battle with the Amalekites, and occupies the four large lights. There are three small subjects in the tracery, which represent, on the left, "The finding of Moses; on the right, "The Destruction of Pharaoh's Host in the Red Sea;" and, in the centre, "Moses holding up the brazen Serpent in the Wilderness." Angels with palm branches, &c., fill up the remainder of the tracery. Messrs. Edmundson & Son were the artists.

Christ Church, Blackburn.—A memorial window, in stained glass, has been erected in Christ Church, Grimshaw-park, Blackburn, to the memory of the late Robert Hopwood, esq., of that town, a donor to that and other churches. The window is 16 feet high by 8 feet wide. The style is Decorated Gothic. The subject, extending over all the lower lights, is "The Last Supper." The treatment of this subject, from designs furnished and executed by Messrs. Baillie, of London, is peculiar. The Saviour, as if to mark his special affection for "that disciple whom Jesus loved," has risen from His seat, and is administering the holy communion to the youthful communicant, who meekly receives the symbols of his Saviour's death on his bended knees, to the surprise of the other disciples, more especially of St. Peter. In the tracery lights, in the first row above the subject, on the right and left, are the bread and wine. Above these are angels in the act of adoration, and the whole is surmounted by a celestial crown.

PROVINCIAL NEWS.

Barnard Castle.—The Mechanics' New Hall here has been inaugurated. The new building is an addition to the Witham Testimonial, erected some fifteen years since, for the use of the Mechanics' Institution, and comprises a large hall capable of seating 700 people, an orchestra or proscenium, to accommodate fifty or more speakers or performers, with two side rooms, and another apartment, with a separate entrance for the use of the savings bank. The whole was designed by Mr. Bryson, architect, and carried out by Mr. Appleby, contractor; the entire cost being about 900*l.*

Liverpool.—The finance committee of the town-council have been empowered to sell to Messrs. Lightbody & Boult, on behalf of persons not named, a portion of land in Dale-street, belonging to the corporation, at the sum of 40,000*l.* This land was originally offered for the sum named to Government as a site for a post-office. The persons taking it bind themselves to expend 70,000*l.* in erecting a building on the site. It is said that the intention is to erect a leviathan hotel on the American principle.

Southport.—Twenty million of bricks, says the *Ormskirk Advertiser*, are now wanted in Southport, for the building of 100 more houses.

IRISH BUILDING NEWS.

THE town of Balbriggan has been lighted with gas by Mr. Daniel, of Mary-street.

A new wing is being erected to the Royal School, Dungannon, adjoining the Armagh road, which will nearly double the accommodation of that edifice. Mr. McCurdy is the architect; Mr. William Geatens, of Dungannon, the contractor.

The works at the new Protestant Hall, Waterford, are progressing rapidly: one of the towers is entirely finished. The main building is roofed in, and the ceiling nearly completed: it is lighted by means of two very efficient gas deflectors. Mr. Fitzpatrick is the contractor.

A new cross has been presented to the inhabitants of Garey, by the Right Hon. Sir F. Esmonde. It is erected in front of the Parochial Church of St. Michael. It is of granite, and is 25 feet high from the base. The lowest stone of the shaft weighs 3 tons. On each of its sides are deeply-sculptured recesses, containing four figures, representing SS. Peter, Thomas, Bartholomew, and James. Higher up on the shaft are figures, life size, of St. John and the three Marys. From this rises a cross, on which is sculptured the dying Christ. The whole has been executed by Mr. Fegan, sculptor, of Sallystown, county Wexford, at a cost of 256*l.*

THE PATENT PAINTED AND GILDED LEATHER CLOTH.

THE majority of our readers have, doubtless, met with the patent leather cloth used to cover seats and otherwise, and many have seen it in its painted and gilded shape as manufactured by the Leather Cloth Company; nevertheless, they would probably be surprised, as we certainly were ourselves, to find a huge warehouse in Cannon-street West, filled with rolls of it. In France it has long been extensively supplied by this company, but here as yet it has only been occasionally used. In the new Westminster Palace Hotel, for example, it is hung in the smoking-room; and, at the Royal Hotel, Bridge-street, Blackfriars, in the billiard and reading rooms. Many of the designs already produced are very elegant; and it may be made to present all the elegance of gilded leather, the *cuir doré* and the *cuir argenté* of the Middle Ages, while its cost is but trifling as compared with those hangings with which, as we know, in the sixteenth and seventeenth centuries all the houses of the Venetian nobles and gentry were hung. In England, too, it was greatly used, and examples may still be found in old houses. The cost of the painted and gilded leather cloth may be called about 2s. 6d. a yard square, being enamelled by a patent process, which preserves the original beauty of the gilding, and allows it to be washed without injury. It is very durable, and it could be hung on new walls, on which it would not be safe to paint or put paper.

This company, who have manufactories also in France and Belgium, have large works at West Ham, where they employ about 150 men. Looking over their warehouse, we saw large quantities also of their vulcanized India-rubber belting, which, as being more durable, appears to be fast superseding the leather belting.

CESSPOOLS IN SALFORD.

SIR,—I send you some extracts from the Salford paper, by which you will see that while you good folks in the south are spending your hundreds of thousands of pounds in endeavouring to alter your system of drainage, we in the north are following out the *good* old plan of cesspools, and are in a fair way to obtain a profit from that which is a source of great expense and trouble to you.

The following is the system pursued here:—Nearly all the houses are built with a passage, called an "entry," running the whole length of the backs of the houses: a large cesspool, or "midden," is constructed between every two houses, with an open space for ashes between, closed with doors in the walls of the entry, through which it is emptied regularly, under the direction of the police, by the town scavengers, in the night time; the only deodorising material used here being the ashes and other refuse thrown down the cesspool.

Of the *successful* operation of the above system, which seems to be so highly spoken of and recommended by our local authorities, I leave you to judge when you have read the annexed papers.

T. J.

*** The pith of the statements is to the effect that there are districts in Salford where a pestilential air predominates, and which give an average (per annum, we conclude) of 47 deaths in a thousand! If this be correct, the authorities are permitting the perpetration of wholesale murder under their very eyes, and in spite of their very noses.

TOWN SEWAGE OUTLET WORKS.

THE experiments made at Croydon in attempting to purify sewage are only valuable in so far as they furnish actual results. In each case, as described, the sewage seems only to have had the solids of the sewage intercepted; and, I believe, recent chemical analyses prove that the result of any known process of so-called disinfection or purification of sewage is merely a separation of the solids, and is not in any degree a chemical purifying. The effluent water remains true sewage water, full of the soluble salts of sewage, as if mechanical filtration alone had been used. This effluent water, however bright to sight and pure to smell, is true sewage; and, as such, ought to be conveyed to agricultural land for purposes of vegetation. Even after passing through 6 feet

vertical of land under cultivation, water escaping from the land drains will be found, on analysis, to contain manure in solution, not so strong as at first, but strong enough, in many instances, to warrant a second use in irrigation, and sometimes, probably, a third and fourth application, if the site is favourable for this form of irrigation.

The cost of sewage works ought to be kept down, as also the cost of working. Tanks constructed with brickwork are not, in all cases, necessary. Canals or tanks may be formed with side slopes of say one to one in earth, at a very light cost; and in such tanks or canals the sewage may be strained free from all solid and flocculent matter, by hurdles, in which gorse has been secured, so as to stop all floating matters. Simple liming will hasten deposition; but, excepting in hot weather, this may not be necessary. The "floating crust" found on the surface of the sewage in the tank at Croydon is not all due to the chemicals used, but is partly due to the oxygen of the atmosphere. Such a scum or crust is found on the foul rivers and canals in and near Manchester, and other places, at all times; but most during warm weather. The Croydon sewage tanks might probably have been made as effective without brick side-walls; and, if so, the cost would have been saved. At several places expensive tanks of brickwork for filtering sewage have utterly failed, as at Rugby, for instance. Let our engineers try simple and inexpensive means to free sewage from its solids, and then to get the clear-looking water conveyed to land in the cheapest possible manner, and all parties will be benefited. If the sewage cannot go to the land it must go, without its solids, into the nearest water-course, river, or the sea.

CIVIL ENGINEER.

ARCHITECTURAL EXAMINATION.

I CANNOT refrain from offering an observation on the proposed examination of those who contemplate following the profession of an architect. Whether the examination should be compulsory or voluntary, I believe it would be a great advantage to the rising generation if those who are competent to form an opinion, and who have suffered in early life in an architect's office by having received little or no instruction, would suggest a proper routine for study to be followed. Many have not the advantage of a classical education; but still there are many subjects to which their attention might be drawn for their study and consideration, and which would prove, and they would derive, an advantage in future life. For instance, if the student were told it would be to his advantage to have a correct insight into arithmetic, geometry, algebra, mensuration, levelling, land-surveying, estimating, perspective shadows, geology, trigonometry, together with a general historical knowledge of the profession, a young man would then have before him a system laid down for his general instruction, which I regret to say *never was the system adopted in an architect's office many years since.* A heavy premium was paid for six or seven years, and during that time not one word of instruction was imparted, no opportunity afforded to see the progress of construction, and neither in drawing, perspective, nor any of the useful requirements in following the profession in after life. Therefore I feel for the rising generation, if a proper system of instruction were laid down, it would prove a great boon to many, whether they might feel disposed or not to pass an examination; at all events, they would be generally qualified, and feel better satisfied with themselves, and feel grateful to those who had put them in the right road for preferment. I should therefore be an advocate for examination, which need not be so strict as to deter young men from such a course or dishearten them in their prospects in life.

A FRIEND TO THE YOUNG ARCHITECT.

NEWCASTLE SAVINGS BANK COMPETITION.

AT the adjourned annual meeting of this institution the members proceeded to select one of nine sets of plans sent in for new Bank premises. It was arranged that voting should be on all the nine, and that the mode be by ballot. The result of the first scrutiny was,—Mr. Johnstone, five votes; Messrs. Oliver & Lamb, three votes; Mr. Watson, nine votes; Mr. Wardle, two votes; Anima non Astatia, one vote. Mr. Watson not having an absolute majority of all the votes, a ballot was again taken between him and Mr. Johnstone, with the following result:—Mr. Johnstone, six votes; Mr. Watson, fifteen votes; consequently the premium of 50*l.* was awarded to Mr. Watson. A building committee for the purpose of carrying into effect all such measures respecting the proposed new building as may, from time to time, be referred to them by the General Board of Management, was then appointed.

NORTHAMPTON TOWNHALL COMPETITION.

SIR,—It may perhaps ease the mind of "A Competitor" to know that one of the sons of one of the architects of Northampton does not intend (nor has he at any time mentioned his intention) to compete for the new townhall.

W. HULL, Jun.

APPLICATION OF SEWAGE.

CARLISLE.

SIR,—I quite agree with the writer of the article in your number for the 8th inst., headed, "The Sewage for the Soil," that the public may obtain valuable information from all schemes for the application of sewage to the soil which may be carried out.

I send this communication in order to contribute some information on the Carlisle experiment, and also to correct an error into which the writer has fallen as to the engineers of these works.

Considerable alarm was felt by many persons in Carlisle when it was first understood that the low-lying land in the vicinity of the town was to be irrigated with the sewage; but I can unhesitatingly state that, during the past year, there has been no inconvenience felt therefrom, and no complaint from any person on this account, while it has been equally obvious to the eye that a powerful stimulant had been applied to the growth of the grass. So far the experiment has been a highly satisfactory one in a sanitary point of view, and I should rejoice to hear that it has been equally successful financially.

The error in the article is the statement that Mr. McDougall was the engineer of these works. He is the lessee of the sewage of Carlisle, and the inventor of the disinfectant used; but Messrs. McKie & Mansergh were employed by him as the engineers of the works, and had the sole responsibility of practically carrying them out.

ISAAC CARTMELL.

MASTERS AND WORKMEN.

Mayo, Rivenel, and Others v. *Beckett.*—This was an action, tried in the Marylebone County Court, to recover wages for work done and loss of time. Mr. Lewis, instructed by the London Amalgamated Association of Operative House Painters, said the claim involved a principle whether the employer is not liable for loss of time incurred by workmen when kept waiting for materials. The plaintiffs are journeymen glaziers, lately employed by the defendant at the New Railway Station, Pimlico. They were engaged on the 22nd of October, and commenced work. On the following day, being short of glass, the defendant told them not to leave the job, for he expected more glass to arrive every minute. Therefore, complying with the request of defendant, no deduction ought to be made from their wages. The plaintiffs corroborated the above statement.

The defendant admitted the want of glass, but did not consider he was liable for the men's loss of time. Several witnesses having been examined, his Honour was of opinion that, if employers through neglect kept workmen short of materials, and a loss of time occurred, it would be unreasonable to deduct the loss from the wages of the workmen.

Verdict for plaintiffs, with costs.

LIGHT AND AIR CASES.

Cutler v. *Hedges.*—This was a motion heard in the Vice-Chancellor's Court on behalf of the lessee of No. 15, New Burlington-street, for an injunction to restrain the defendants, Messrs. Hedges & Butler, of Regent-street, from increasing the height of a building at the rear of the plaintiff's house, and from erecting dormer windows on the roof thereof, so as to prevent the plaintiff from enjoying the same amount of fresh air and light through his windows as he has hitherto and of old been accustomed to enjoy. The plaintiff complained that the defendants had raised a building at the rear of his house, about a foot in height, and that they had placed on the roof thereof, which slanted northwards, dormers (which were windows projecting from a slanting roof), and that the raising of such building and the placing of such dormers materially diminished the amount of light in the rooms, or some of them, at the rear of his house. It was stated that before the suit was instituted the plaintiff had said that he would be content if the dormers only were removed, and that the roof might remain at its present height.

Mr. Malins and Mr. Cutler were for the plaintiff; and Mr. Bacon and Mr. G. Simpson for the defendants.

After the case had occupied the court a considerable portion of the day,

The Vice-Chancellor suggested that the dormer windows should be removed from the north to the south side of the defendant's building; that such building should remain at its present height; and that there should be no costs on either side; and an order to that effect was accordingly made by consent.

PATENTS CONNECTED WITH BUILDING.*

CHIMNEY-TOPS.—*R. Atkinson*, Southampton-court, Tottenham-court-road, London. Dated 11th April, 1860.—On the outside of the pipe or tube forming the chimney-top is fixed a series of vertical ribs, with tapering cross-pieces attached to the edge thereof, forming a series of T-shaped ribs round the said pipe or tube. When the wind strikes the chimney-top it enters between these T-shaped ribs, and its egress being prevented by the overhanging edges of the said ribs, it is forced to travel upwards, through openings provided, into the interior of the chimney-top, and thus causes an upward current. A series of chambers are also provided round the exterior of the chimney-tube or pipe, and communicating with the interior, for the purpose of increasing the upward current of air; and there are also short exterior tubes or flat rings for directing and dividing the currents.

ATTACHING KNOBS TO SPINDLES OF DOORS.—*W. Bate*, Wolverhampton. Dated 26th April, 1860.—This invention consists in a new and peculiar method of connecting and attaching the spindles to the knobs of locks and latches, so as to permit of their being used with doors of different and varying thickness, which the patentee accomplishes by providing a series of holes one quarter of an inch apart, through one of which a screw is passed from side to side of the neck of the knob. By this means he obtains a rough adjustment of the length of spindle. At the opposite end of the spindle he provides another set of holes, but only one-sixteenth of an inch, or less, apart; and by securing the other knob, by means of a similar screw passed through one of the closer-placed holes, he is enabled to correctly adjust the length of spindle as required.

IRON OR GLAZED STRUCTURES FOR HORTICULTURAL OR OTHER PURPOSES.—*T. H. P. Dennis*, Chelmsford. Dated 11th April, 1860.—The patentee uses wrought or cast-iron pillars for the main supports, attached to which are bosses having dovetails, mortises, or joints arranged to receive horizontal plates. The dovetails to fit these mortises are formed from the solid wrought or cast-iron plates, either on one or both sides. The end rafters are attached to the ridge by a sliding bolt: the sash-bar or intermediate rafters are also fixed to the ridge and front plate, either by forming a hook from the end of the sash-bar or rafter, or by affixing iron clips thereto. In the latter arrangement, distant pieces are necessary. The end bars or lights of a house are fixed, either with iron clips, having a mortise in the upper side to receive the bars, or by cutting mortises from the bars to fit up to and clip the plates. The iron clips are made suitable for wooden structures where iron sash-bars are required. The pivots upon which the front sashes hang are formed from their own frames, and swing upon the iron mullion of the house: the sashes can be drawn entirely out. The dovetail joints and fastenings, by which the sash-bars or rafters are held in place, are applicable to any shaped building.

FLOORINGS AND ROOFINGS, AND OTHER PARTS OF BUILDINGS.—*X. Tarte*, Rue de l'Union, and *W. Toovey*, Rue de la Pompe, Brussels. Dated 25th April, 1860.—To obtain lightness, strength, and freedom from fire in construction, there are formed eight framings of wrought metal, which are covered on the upper, and, if desired, on the lower sides with plates of sheet metal, the whole being united together by nuts or screws, or other suitable bolts. When for floorings, the upper surface of these constructions may be covered with wood, or any other suitable material, and the under surface with lath and plaster, or any other suitable material to form a ceiling. Sometimes the surfaces are formed by means of plates laid in angular channels, and connected together across the upper and lower angles by transverse straps or plates, or by the aid of blocks of wood when for roofing. The invention cannot be described without reference to the drawings.

* From the *Engineer's* lists.

Books Received.

Fairbairn's Crests of the Families of Great Britain and Ireland. Compiled from the best authorities, by JAMES FAIRBAIRN, and revised by LAWRENCE BUTTERS, Seal Engraver in Ordinary to the Queen for Scotland. Edited by JOSEPH MACLAREN. In 2 vols. Edinburgh: Thomas C. Jack. London: Hamilton, Adams, & Co.

THE first volume of this useful work contains an alphabetical list of more than 30,000 families, with their respective crests, as they may be found on the rolls of the Heralds' College, and another of nearly 5,000 mottoes, with translations from alien or obsolete languages. There is also a Glossary of heraldic terms. The second volume is occupied chiefly with nearly two thousand well-executed plates of different crests. Most of these are common to many families, no less than 162 bearing the stag-head, while 181 are distinguished by the same, *erased* and *attired*; but many others, such as the Pegasus, appear to be claimed by one family only. There are few materials for com-

mentary, further than to recommend the work to those who may not be acquainted with its contents, as a depository of valuable information for all interested in tracing the descent of families.

Many of the crests, we may remark, record, as is very well known, a very savage state of things as the boasted origin of families; but a few even excel in this regard; one, for example, consisting of a tatooed savage; another of a grisly head stuck on a dagger. Very absurd, too, in appearance, are some of these crests. The Vandyke family, for example, have an eagle stuck into a barrel, with one of its wings torn off; or, in heraldic language, it consists of "an eagle's head and neck in a tun, dexter wing elevated, sinister cut off and lying on wreath."

As a whole, however, family crests are full of interest and significance: it is only to be regretted that this well got up and useful work contains little or no information as to the history or origin of, or reasons for, the adoption of such symbols, as denotive of families, and their names and deeds. A third volume, with a mass of explanative but condensed references, would seem to be called for, in order to render the work complete. A single word would very often suffice to explain what is now a mystery to all but a few.

A very useful art-feature in the second volume is a series of plates of monograms, for the use of family-plate manufacturers and others. There are also specimens of lettering, crests, and scrolls and garters with mottoes, heraldic illustrations for chargings, &c.; British and foreign crowns and coronets, regalia, orders, chaplets, and helmets; city arms, and flags of all nations. This second volume also contains a glossary, key to plates, &c.

In the preface the editor regrets the decline and fall of heraldic influence and heraldic studies, which he ascribes to the unquestionable fact that "the honours due to genius, valour, patriotism, and industry, have been bestowed too much in the spirit of party."

The British Almanac and Companion for 1861. Knight & Co., Fleet-street.

MR. CHARLES KNIGHT contributes to "The Companion" an interesting and valuable paper, "Localized Handicrafts in South Midland Agricultural Districts." These are chiefly non-factory employments, such as refer, for example, to straw-plait, lace, and shoes, concerning which the statistical knowledge possessed is not precise. The social position of the females engaged in the straw-plait trade is a matter of serious interest. Thames Embankments, Reformatories and Ragged Schools, and the South Kensington Museum, afford subjects for other papers.

The "Companion" has, as usual, its article on "Architecture and Public Improvements," but on the present occasion it calls for no observation from us beyond this, perhaps,—that inasmuch as it could not have been written but for the *Builder*, the fact that the *Builder* is not once mentioned may be placed in the category of things "cool."

VARIORUM.

BEETON'S "Christmas Annual" (248, Strand) gives for a shilling such a variety that it can scarcely fail to command a large sale,—a detached illuminated almanack (with flowers of monstrous size, by the way), a sheet of puzzles, and a book of tales, conundrums, charades, tricks, and what not, the whole illustrated with wood-cuts.——And, talking of wood-cuts, we must again praise those in "The British Workman," the sixth yearly part of which has just been issued. It is a miracle of cheapness, and is doing much good.——"Stanford's New London Guide" (6, Charing-cross), contains a large amount of useful information; but it should be revised by a competent hand, to prevent the appearance of such an erroneous assertion, for example, as that Westminster Hall, the crypt of "old St. Paul's," that of St. Stephen's Chapel within the Palace of Westminster, and the *entrance* to St. Bartholomew's Church, are remains of the Norman period!——The Christmas number of "The Welcome Guest," titled *Snow-bound*, is an amusing bundle of stories told in a railway station while waiting for a train stopped by the snow. The fault is an over abundance of robbery and murder. Perhaps, however, at Christmas, people look for spice.——A third edition has been published of Dr. Lankester's valuable and comprehensive "Guide to the Food Collection in the South Kensington Museum."—— Viollet-le-Duc's "Essay on the Military Architecture of the Middle Ages" (J. H. & J. Parker); and Mr. Miles's "General Remarks on Stables, and Examples of Stable Fittings" (Longman & Co.), will receive early notice.

Miscellanea.

MEMORIAL OF CROMPTON. — The people of Bolton have subscribed to erect a statue of Samuel Crompton, who invented the "mule" which has given fortunes to hundreds, and bread to thousands. After some discussion the commission has been given to Mr. W. Calder Marshall, R.A.

STREET TRAMWAYS.—Mr. Train has received permission from the vestries of St. John's, Hackney, and St. Leonard's, Shoreditch, to lay down a line from Ball's-pond, along Bridport-place, Pool-street, Dorchester-street, New North-road, Pitfield-street, Old-street-road, and City-road, towards the City.

BRITISH ARCHÆOLOGICAL ASSOCIATION.—At the second meeting of the session, held on Wednesday, the 12th instant, Mr. G. Godwin, V.P., in the chair, Mr. T. J. Pettigrew read an elaborate paper "On a Seal of Richard Duke of Gloucester, as Admiral of England and Earl of Dorset and Somerset,"—showing that he received that appointment in the 2nd and in the 11th Edward IV., and that the seal must have been, from the titles expressed on it, executed between the years 1471 and 1475. Afterwards, Mr. Syers Cuming read an interesting paper "On the Employment of Tubes and Hollow Bricks in Ancient Buildings." The Chairman made some general observations on the subject as affecting cottage-building.

ROYAL ENGLISH OPERA, COVENT-GARDEN.—Mr. Balfe's new opera, "Bianca, the Bravo's Bride," is pursuing a successful career, but must be stopped for a night or two because of the time that will be occupied, in the first instance, by the forthcoming pantomime. "Bianca" contains some of Mr. Balfe's best music, and is sung by Miss Pyne admirably. Mr. Harrison, too, does all that need be done, and the chorus is excellent; but, with these exceptions, the opera is not efficiently sung. To Miss Pyne and Mr. Harrison the English public are indebted for the establishment of an English opera-house on sound grounds; but, if they would maintain their position, they must strengthen their company.

THE NEW ORPHAN HOUSES AT ASHLEY DOWN, BRISTOL.—Another annual report, by Mr. Mullar, the founder and conductor of this extraordinary establishment, has been given; from which it appears that he is now building accommodation for an increase of the number of orphans to be provided for, from 700 to 1,150, at a cost, for building, of 23,000*l.*, and an additional yearly expense of about 5,200*l.* For the current year, he states that 50*l.* a day is required, and more as the work proceeds. It is a scarcely credible fact that it is almost entirely by what may be called a "hand-to-mouth" system that these many hundreds of poor orphans are being fed,—a system which has, to a constantly progressing extent, been successfully pursued for the last quarter of a century, by the same singular man, who attributes his success to the power of daily and believing prayer alone; whereby, from day to day, contributions come tumbling in from all quarters, tradesmen giving percentages on all their profits, professional men a share of their income, in one case amounting to nearly one-half, ladies their jewels, clothing, &c., all for behoof of the poor little orphans. Mr. Mullar, it appears, has always enough coming in to keep him going without either credit or debt, but seldom much more; and at times he scarcely knows, from day to day, where the means are to come from for the next day's provision, yet it never fails to come. This is certainly a wonderful phenomenon; but it is also a fearful risk: still, we dare say, in case of any sudden short-coming, at least for a time, no difficulty, on the score of credit, would arise. The greatest risk, perhaps, is that of the sudden or unexpected death of the devoted and remarkable head of the institution. The new building, as noted, will cost some 23,000*l.*: of this sum he has already 21,282*l.* on hand, and "every day brings him fresh supplies," often in very small sums. Of the general expenses, he has a balance of 9,358*l.* to begin the year with; but, besides the orphans, he has schools, missionaries, Scripture circulation, &c., to provide for, in a similar way; and, for all this, he has a separate income of about 10,000*l.* a year, of which there was a balance of 2,392*l.* in hand. In all, the sum in hand, when the report was made, amounted to 33,033*l.*; and the grand total of annual expenditure to 72,182*l.*; out of which sum he allows himself—nothing per annum, by way of salary; or rather perhaps, we should say that he has a salary of 72,000*l.* a year, and spends it all on his little orphan family.

FALL OF AN IRON ROOF AT LLANELLY.—The skeleton iron roof of the new building in course of erection at the Llanelly Copper Works has suddenly given way, bringing with it three workmen. One fell 18 feet, but escaped unhurt; while the other two fell from the height of from 30 to 35 feet, and were very much injured. The span of the roof is nearly 60 feet, and the weight of the iron which fell, being fifteen iron girders, was not far from twenty tons.

READING.—The Abbey Gateway, according to the local *Mercury*, "*daily* manifests further indications of a fall on its northern side;" and, he adds, "if the further consideration of the restoring is made over to Mr. Scott, it is quite clear that all difficulties will be removed long before any decision is arrived at."——The new Assize and Police Courts approach completion. The civil and *nisi prius* courts are in a forward state. As repects the position of the grand jury gallery, the paper just named says, "We believe it will be found that very few judges will be able to make themselves heard at such a distance, and there will also be some awkwardness discovered in conveying the bills to and from." The floor of the large hall is being paved with Poole tiles of various colours; but, on the occasion of balls, a temporary boarded floor might be laid down at a small cost. There are a large number of offices connected with the courts. The grand jury room is fitted with a "sun light." A hot air apparatus is carried throughout both the police and assize departments, and is introduced into every office.

OPENING OF A NEW CATTLE MARKET AT NEWCASTLE-UPON-TYNE.—The new cattle market recently opened, and which is situated at no great distance from the old one, will afford accommodation for about 3,000 head of cattle, or about three times the number hitherto adequately provided for. The site of the new market is immediately on the west side of the Infirmary. The area is about two acres and three quarters, surrounded by a stone wall surmounted by iron palisading. The entrance is through gates in Marlborough-street, and one at the east end of the market. The pens are accessible from five alleys running parallel with Marlborough-street, the whole length of the market, and 17 feet in width; these again being intersected by two cross alleys of 30 feet in width. The pens are constructed of oak, and forty of them are appropriated as stands for bulls, being of great strength, with ring-bolts, &c. All the alleys and the two principal crossings are paved with blue whin Fife-stone, and the pens with freestone. There are seven entrance-gates; and, as soon as the new street is formed to the south of the market, another will be formed on that side. The market is fitted up with gas; and with water from the Whittle Dean, and also from the Bath Lane.

ELECTRO-TELEGRAPHIC PROGRESS. — All the metropolitan police stations are said to be now connected by telegraphs, and the fire-engine stations will very shortly be in similar communication. The wires are all carried over the houses, and are in many instances supported by the church steeples. Many of the newspaper offices are about to be supplied with wires from Mr. Reuter's office, and in one case a newspaper in Fleet-street will have private wires to the Houses of Parliament. Mr. Reuter has made a proposition to the London daily papers to report the whole of the proceedings of both Houses of Parliament. He proposes to have one corps, and, as we have said, to have wires laid to each office, so that the report can be printed from a copy written out by a telegraph clerk.——One of the first acts of Count Persigny's administration, it is said, will be the completion of the telegraphic wires by which the chief towns in each arrondissement will be placed in communication with each other and with the more important centres of population in the empire. The reduction of the price paid for transmitting telegraphic messages likewise occupies the Count's attention. Although the original price charged by the Government has been reduced, the transmission of telegraphic messages is still beyond the reach of the majority of the public. The consequence is that the annual produce of the telegraphic department is much less than it might be, and the country in general is deprived of the advantages of the telegraph.——Experiments are at present being made with a newly-invented electro-telegraphic apparatus which transmits messages textually, giving a perfect *fac-simile* of the handwriting. The reproduction is said to be so faithfully executed by this new apparatus that any description of portrait or drawing may be forwarded with as much facility as a simple message. It is of this invention we presume that the *Journal du Havre* speaks as an Italian one.

The Tyndale Monument: Curious Proposal.—Earl Ducie proposes that the column to be erected to the memory of Tyndale, should be surmounted by a parabolic reflector or mirror of some kind, which might be so constructed as to reflect the sun's rays through a large angle and be visible at a great distance, across the Severn, and up and down the line of the Midland Railway. "This reflector would," it is said, "have a very beautiful effect, during many hours of the morning and evening in summer, and throughout the whole period of sunshine on a winter's day, and would strikingly illustrate the great event of Tyndale's life which it is proposed to commemorate."

Monumental.—The proposal to erect a statue to the late Lord Macaulay in Trinity College, Cambridge, has met with a hearty response. The Prince Consort, Chancellor of the University, has headed the subscription with 100*l*. An influential committee of "residents," with Dr. Whewell, the Master of Trinity, at its head, has been formed for the purpose of carrying out the arrangements. ——A monument has been erected on Southsea Common to commemorate the late Sir William Peel, who died in India at the head of the Naval Brigade during the Sepoy mutiny.——Lord Dundonald, it seems, is to have a monument at Liverpool, and several subscriptions, headed by the Mayor, have already been announced for the purpose.——We regret to hear so little said of Admiral Napier, who surely merited a place in St. Paul's, with something monumental to remind us of the bluff old sailor, who did some brilliant deeds in his lifetime.

Central Railway Station in the City.—The Court of Common Council have adopted a report of their Improvement Committee relative to the establishment of a central railway station in the City of London. The report stated that it was absolutely necessary that there should be a central railway station in the City, and that the best site for it would be Farringdon-street;—that the effect of having the station at this spot would be to materially improve Holborn-hill and Skinner-street, and reduce the gradient from 1 foot in 19 to 1 foot in 40 in the case of Holborn-hill, and 1 foot in 46 in Skinner-street, which alone would be a most important improvement;—that it would also greatly improve the City property in Farringdon-street and Victoria-street, and be of very great importance in connection with the proposed new market in Smithfield. The report concluded with a recommendation that the court should continue their powers to carry out the proposed plan.

"Needful Repairs" of a House.—In the Court of Common Pleas, last week, was tried the case of *Scales* v. *Laurence*. It was an action for breach of covenant to repair and make "all needful reparations," reasonable wear and tear excepted. 30*l*. were paid into court. The plaintiff's estimate was 60*l*.; the defendant's, 16*l*. The house is the Swiss Cottage, at Tottenham, which had been built 150 years ago. The case for the defendant was, that it was dilapidated when he entered it, and that seven years before the close of the term he had put it into repair. The plaintiff's answer was, that the rent (50*l*.) was low. The house contained three sitting-rooms, four bed-rooms, the usual offices, a large garden, a field, stable, conservatory, &c., and that the defendant took the house, knowing its condition. Mr. Justice Willes: On such a covenant a tenant is bound to put the premises into good repair if out of repair when he entered, and to keep it in repair, having regard to its general character and condition; but he is not liable for new papering, which is purely ornamental, and not expressed in the covenant. It is a matter to be decided by the jury. According to common sense, rather than the strict construction of law, if the tenant had painted the outside within three years, and the inside within seven years, and there had only been fair wear and tear since, he was only bound to cleanse the old paint, &c., and not to repaint. So, as to other repairs; the tenant was not bound to give the landlord a new house, but the old house in reasonable repair, with reference to fair wear and tear. The maxim, "give and take," must in such cases be applied; and a landlord ought not to claim for every crack in the glass or every scratch on the paint. The question was whether there had been a substantial performance of the covenant. The tenant was entitled to have the benefit of repairs he did, and was not bound to make them just before he left, so as to let his landlord have the whole advantage of it, and have none of it himself; for the landlord, not the tenant, had to bear the burden of fair wear and tear.—The jury immediately returned a verdict for the defendant.

Co-operative Profits.—The Wardle Co-operative Manufacturing Company, we hear, has declared a dividend of 60 per cent. on the past half-year; and other companies in the Rossendale district are in so flourishing a condition, that large dividends will be paid to the shareholders.

Fall of a Warehouse in Liverpool.—On Saturday before last, about three o'clock p.m., a large portion of tenement, situated at the corner of Jordan-street and Chaloner-street, suddenly gave way; and, with a rush, the front and corner walls, beams, floors, and roof, with the contents of the different apartments, settled down in the street. The portion of the warehouse which fell is almost new, having been recently rebuilt after a fire which occurred on the premises about twelve months ago. It was four stories in height.

Lincoln Grammar School Competition.—Sir,—In your notice of the Lincoln Grammar-School competition you mention one of the five designs selected for further consideration, with the motto "Ides," with names unknown; so I beg to inform you that the unknown authors of that design were myself and Mr. James Thomson. Our names were attached as usual in such cases, but I suppose overlooked: hence the only means of making the unknown known will be by your courtesy through your wide-spread journal.—George Simmonds.

Linseed Oil.—Allow me to thank a "Friend to the Unemployed" for his remarks respecting the adulteration of linseed oil. I would suggest that the manufacturers or merchants should be subjected to a similar ordeal as the *Lancet* uses towards different tradesmen, viz., to purchase samples from each, and publish the result of an analysis, giving the name of the firm that sold the genuine article. If linseed oil is scarce, let us have what there is genuine, at the market price, because it must be genuine to answer our purpose. The present substitute will not do.—A. B.

Fall of Houses in Kennington.—Sir: You mentioned briefly the fall of houses in course of erection near Kennington-park. If the poor fellows who were buried beneath the falling materials, and almost crushed to death, should not survive, an investigation will take place, and show how inadequate are the powers of district surveyors in preventing speculative builders erecting such dangerous structures as those in question. There are several of a similar description, in close proximity, now erecting, and equally dangerous. Mortar of lime and mould from the excavations; joints to brickwork averaging ¾-inch and 1 inch; arches without skewbacks; neither iron nor other bond; spruce deal joists, 7 inches by 1¼ inch; lintels, 4½ inches by 3 inches, carrying the floor; joists over openings, 4 feet 6 inches wide, without discharging arches or any other support but the head of sash-frames. They will vie with houses at Brighton, which are the climax of scamping.—A Clerk of Works.

The Coventry Ribbon Trade.—An excellent example, so far as regards the distressed weavers of Coventry, has been charitably set by the Baroness Brunow, who, as Messrs. Grant & Gask, of 60, Oxford-street, inform us, has ordered, through their firm, a dress, to be made principally of Coventry ribbon, and for the completion of which about 500 yards will be required. It is to be hoped so excellent an example will be widely followed by other ladies. A suggestive one at our elbow (while giving her vote—a plumper, of course—in favour of the ribbon dresses, one of which she wishes she may get, just to see how it would look), says she knows of a desideratum which might also perhaps be of considerable service, at least at a future time, to the ribbon weavers; while it would be "a real blessing" to milliners and mantua-makers, both amateur and professional, could it only be realized by some inventive brain. From what we can understand as to this desideratum, it appears that, in the making of bonnets, dresses, cloaks, &c., the cut materials are often required to be what are called "on the cross," in order that they may set or fit more handsomely; and that, for this purpose, such materials are cut crosswise,—or slopingly, rather,—cut of webs of silk, or velvet; but that, in doing so, there is not only very little economy, and some disfigurement by frequent joinings, but often great waste, and considerable additional cost. Now, says our suggester, could we only have what I shall call "cross ribbons," broad and narrow, so woven as to imitate the cut material "on the cross," an end would be put to a great deal of waste slashing, aslant silk and velvet webs, and rejoining of the materials so cut; and a new branch of the ribbon trade might thus arise, to replace, so far at least, that which has fallen into disuse.

The Sewage of Canterbury.—The subject of utilizing sewage is about to be taken up at Canterbury. Some gentlemen connected with agriculture have met to discuss a plan for irrigating the Sturry marshes with the Canterbury sewage.

The Glasgow Queen's Park.—The Glasgow Town Council have resolved to devote 8,000*l*. in laying out the main roads and walks on the plan of the Queen's or South Side Park, as modified by Mr. Carrick, the city architect. A long discussion has taken place upon the method of laying out the park. Some members are in favour of its being laid out in the Italian style of gardening, others preferring that it be laid out as an airing and recreation ground for the people.

How to bring down Rain.—Mr. Weeks, of Sandwich, writes as follows to Mr. Rowell, who, at the British Association, suggested the possibility of bringing down rain from the clouds at pleasure:—"I have from very early life been an assiduous experimenter with electric kites, atmospheric exploring wires, &c. Now I beg to assure you that it has several times happened that, when my kite has been raised immediately under a distended, light, fleecy cloud, at a moderate elevation, a free current of sparks has passed from the apparatus during some ten or twelve minutes. I have suddenly found myself bedewed with a descent of fine misty rain; and, on looking up, have seen the cloud upon which I was operating surprisingly reduced in magnitude."

TENDERS

For setting out, excavating for, and forming, roads, footpaths, and sewers, on land east side of railway, for the Great Malvern Hotel Company. Mr. E. W. Elmslie, architect:—

Hayes & Warmington	£1,350	0	0
Edwards	859	0	0
Holt (accepted)	828	0	0

For two villas at Snaresbrook, Essex. Mr. Read, architect. Quantities supplied by Mr. Raggett:—

Macey	£3,700	0	0
Hedges	3,587	0	0
Lawrence & Sons	3,548	0	0
Coleman	3,389	0	0
Hill	3,284	0	0
F. & F. T. Wood (accepted)	3,280	0	0

For the erection of a public-house, the "Rose and Crown," High-street, Wapping, for Messrs. Taylor, Walker, & Co. Mr. Charles Dunch, architect. Quantities by Mr. Curtis:—

Perry	£1,490	0	0
Hedges	1,387	0	0
W. Hill	1,350	0	0
Hack & Son	1,350	0	0
Wood, Brothers	1,320	0	0
Blackburn	1,299	0	0
Ennor	1,295	0	0
Stewart	1,288	0	0
Brown (accepted)	1,144	10	0

The accepted tenders for warehouses for Mr. W. P. Edwards, St. Stephen's, Norwich. Mr. John Daymond Ellis, architect, Norwich:—

Bricklayer, Plasterer, Mason, Slater, and Tiler.

J. W. Lacey	£492	0	0

Carpenter and Joiner.

T. Brooks	£647	10	0

Smith and Founder.

Pinson	£347	0	0

Plumber, Painter, and Glazier.

J. & J. King	£218	10	0
Total	£1,705	0	0

For public-house, Approach-road, Victoria-park. Messrs. Hammack & Lambert, architects:—

Brown & Robinson	£2,180	0	0
Case	2,150	0	0
Page	2,050	0	0
Blackburn	1,999	0	0
Forrest	1,989	0	0
Hedges	1,985	0	0
Perry	1,953	0	0

For building new offices for the Commissioners of Sewers of the City of London, at Guildhall. Quantities supplied:—

Sawyer	£6,970	0	0
Harding	6,800	0	0
Bowley, Brothers	6,586	0	0
Carter	6,459	0	0
Longmore & Burge	5,995	0	0
Bragge	5,986	0	0
Gammon	5,751	0	0
Little	5,711	0	0
Cushing	5,697	0	0
Axford & Co.	5,592	0	0
J. J. & F. Coleman	5,459	0	0
Mcllwraith	5,383	0	0
Wills	5,379	0	0
Willson	5,347	0	0
Batterbury	5,235	0	0
Stevenson	5,219	0	0
Patman & Fotheringham	5,167	0	0
Colls	5,160	0	0
Rider	4,960	0	0
Myers	4,940	0	0
Hill (accepted)	4,892	0	0
Perry	4,728	0	0